



Hamilton

**Air Quality and Climate Change  
Corporate Strategic Plan**

**PHASE I**

**August 2006**

**BUILDING A STRONG  
FOUNDATION**  
H A M I L T O N  
VISION 2020 • GRIDS GROWTH STRATEGY • OFFICIAL PLAN



# Table of Contents

	Page
<b>Executive Summary</b> .....	3
<b>Part 1 – Background</b>	
<b>Introduction</b> .....	4
<b>Air Quality Issues</b> .....	5
Health Impacts.....	6
Natural Environment.....	7
Economy.....	7
<b>Climate Change Issues</b> .....	8
Greenhouse Gas (GHG) Emissions.....	11
Health Impacts.....	13
Natural Environment.....	13
Economy.....	14
<b>The Municipality’s Role</b> .....	14
<b>Part 2 – Action Plan</b>	
<b>City of Hamilton Actions on Air Quality &amp; Climate Change</b> .....	16
The Triple Bottom Line & Air Quality and Climate Change.....	17
<b>Corporate Air Quality and Climate Change Strategic Plan</b> .....	18
Corporate Roles & Responsibilities.....	19
Partnerships.....	23
<b>I Research that Informs Policies &amp; Strategies</b> .....	24
Air Quality.....	25
Climate Change.....	25
Departmental Roles & Responsibilities.....	26
<b>II Response, Engagement &amp; Communications</b> .....	27
Departmental Roles & Responsibilities.....	29

<b>III Adaptation to Smog &amp; Climate Change</b> .....	<b>30</b>
Smog Response.....	31
Smog - Departmental Roles & Responsibilities.....	31
Climate Change Adaptation.....	32
Extreme Weather Events.....	32
Disease Vectors.....	34
Water Quality & Supply.....	34
Built Environment.....	35
Hazard land Management.....	37
Tree Planting & Preservation.....	37
Climate Change - Departmental Roles & Responsibilities.....	38
<b>IV Reducing Emissions, Key pollutants &amp; Greenhouse Gases</b> .....	<b>39</b>
Fleet Greening.....	39
Transportation Demand Management.....	40
Energy Management.....	40
Land Use & Transportation Planning.....	41
City Operations.....	44
Street Sweeping.....	44
Purchasing.....	45
Waste Management and Reduction.....	45
Idling Control.....	47
Departmental Roles & Responsibilities.....	48
<b>V Program Delivery</b> .....	<b>49</b>
Implementation.....	49
Identify Responsibility.....	49
Ensure Regulatory Compliance.....	49
Create an Internal Collaboration & Reporting Structure.....	49
Inter-Departmental Air Quality and Climate Change Working Group.....	50
Clean Air Hamilton.....	50
Climate Change Advisory Committee.....	50
Identify Alternative Service Delivery Opportunities.....	51
Monitoring & Evaluation.....	51
Departmental Roles & Responsibilities.....	51
<b>Recommendations</b> .....	<b>52</b>
<b>Conclusion</b> .....	<b>53</b>
<b>References &amp; Sources of Information</b> .....	<b>54</b>

# Executive Summary

Air quality has been an issue in cities since the Industrial revolution. A number of municipalities have begun to recognize and undertake comprehensive strategies to address poor air quality. The City of Hamilton has addressed a range of air quality issues since the mid 1990s. Through the support of the Hamilton Air Quality Initiative (HAQI) and Clean Air Hamilton, the City has been seen as a leader in air quality improvement initiatives.

Climate Change emerged as a global issue in 1992 with the United Nations Framework Convention on Climate Change. Climate Change has become a prominent issue in Canada since 1997 with the creation of the Kyoto Protocol, which Canada ratified in 2003, to address global climate change.

Air quality and climate change were once perceived as separate issues, one local and the other global in scale. However, research and strategic actions over the past decade show they are linked (e.g. fossil fuel use) and similar impacts (e.g. health, economic, social, infrastructure) can occur locally as smog episodes, increased rainfall, increased heat, etc.

Hamilton has set out specific goals related to air quality and climate change as part of VISION 2020. These goals are:

- *To ensure the City has the best air quality of any major urban centre in Ontario;*
- *To have effective plans that identify, reduce and manage risks; and,*
- *To reduce greenhouse gas emissions (20 percent of 1994 levels in municipal operations and six percent of 1994 levels City-wide).*

Although the Corporation has addressed selected air quality and climate change issues through a variety of policies and programs, a coherent strategy has not been developed. This report proposes a Corporate Air Quality and Climate Change Strategic Plan that would focus actions by the City to address key air pollutants and reduce greenhouse gases.

The Corporate Air Quality and Climate Change Strategic Plan has 5 action categories:

- I. Research that Informs Policies and Strategies;**
- II. Response, Engagement & Communication;**
- III. Adaptation to Smog & Climate Change;**
- IV. Reducing Emissions, Key Pollutants & Greenhouse Gases; and;**
- V. Delivering Air Quality and Climate Change Programs.**

This report presents the 5 action categories and associated programs and policies as separate and discrete areas to be addressed by the actions of City Departments. However this representation may be misleading, as all the categories and areas of the proposed plan are linked to one another, and to a complex array of social, economic, health and environmental impacts and benefits.

Partnerships with stakeholders outside of the Corporation and co-ordinating efforts with the broader Hamilton community (local government, industry and community groups) are essential for reducing air pollutants and greenhouse gases in the City.

# PART 1 - BACKGROUND

## Introduction

Clean air is compromised by the presence of a wide range of air pollutants that come from a variety of sources such as industries and vehicles, and can have significant direct and indirect impacts on the health, the environment and the economy of Hamilton. The impact of air pollutants can be exacerbated by increased temperature and humidity brought about by changes in the local climate.

Many municipalities in southern Ontario have recognized problems of poor air quality, and have developed focussed strategies to address these challenges. Hamilton has a long history with municipal initiatives to address poor air quality, beginning in the early to mid 1990s with the formation of the Hamilton Air Quality Initiative (HAQI) and its current form as Clean Air Hamilton.



Many municipalities in southern Ontario have also created advisory committees or a corporate implementation structure to develop recommendations for action. Implementing such recommendations has resulted in local air quality research, pilot projects, corporate policy directives, and public education campaigns. As in the case of Clean Air Hamilton, some municipalities have also created targeted funding initiatives for community-based actions.

Increasing awareness of climate change and its associated impacts such as extreme weather patterns and influence on local air quality has resulted in municipalities starting to reduce the amounts of greenhouse gas produced by their operations and services, as well as educate the public on climate change. A few municipalities have also begun to understand the need to adapt and mitigate the risks of impacts from climate change.

**Where local air quality is a concern, greenhouse gas reduction strategies can be developed in concert with clean air initiatives.**

## Air Quality Issues

Air Quality has significant direct and indirect impacts on community health, the environment and the economy of Hamilton. These impacts may be experienced in the area near the pollutant source(s) or at great distances through the influence of wind and weather patterns. A 2005 report from the Ontario Ministry of the Environment indicated that about 50% of all contaminants in the air in Ontario (and in Hamilton) were the result of long-range, trans-boundary pollutants from sources in the mid-west region of the United States. Hamilton has a unique microclimate given the proximity of the Niagara Escarpment and Lake Ontario that tends to contain and trap both local and trans-boundary air pollutants over the city.

Sources of air pollutants are varied but primarily stem from the industrial and transportation sectors. The key pollutants are released when fossil fuels such as coal, oil, gasoline, diesel and natural gas are burned for the purposes of transportation or energy in both industrial and personal uses.

There is a perception in Ontario that Hamilton has a serious air quality problem due to the visible industrial base of the city. Analysis, however, shows that local air pollutant levels are generally similar to, or slightly higher than other cities in Southern Ontario. Trends analysis shows that since 1990, air quality improvements have been less dramatic than in the previous two decades. Pollution abatement technologies and strategies continue to be implemented by companies within the industrial sector where measurable improvements to Hamilton's air quality have occurred. There still remains significant need to reduce air emissions from the transportation sector.

### Hamilton's Six Key Air Pollutants:

Nitrogen dioxide (NO<sub>2</sub>)

Inhalable particulate matter (PM<sub>10</sub>)

Sulphur dioxide (SO<sub>2</sub>)

Ground level ozone (O<sub>3</sub>)

Respirable particulate matter (PM<sub>2.5</sub>)

Carbon Monoxide (CO)

### Smog:

The term "smog" refers to the noxious mixture of air pollutants made up primarily of ground level ozone and airborne particulate matter. Smog days have historically been associated with hot humid summer days when air levels of ozone are high, but smog can also arise when levels of airborne particulate matter are high, which can be experienced all year round.

According to Clean Air Hamilton:

- The transportation sector is the leading source of Nitrogen Oxide (NO<sub>x</sub>) emissions within the city, followed closely by the industrial sector.
- The industrial sector is the leading source of directly-emitted particulate matter followed by road dust and area sources such as fireplaces, home heating and businesses.
- Industry is by far the leading source of Volatile Organic Compounds, Sulphur Dioxide, and Carbon Monoxide.

## Health Impacts

There exists strong scientific evidence linking air pollutants like ozone, nitrogen oxides, carbon monoxide and airborne particulates to significant human health problems. Health estimates demonstrate that air pollution continues to present a substantial risk to the respiratory and cardiovascular health of Hamilton residents.

In 1997 and 2003, Clean Air Hamilton undertook research regarding air pollution and health on Hamiltonians. It has been estimated that five key air pollutants – nitrogen dioxide, ground level ozone, fine particulate matter, sulphur dioxide and carbon monoxide -- contribute to approximately 100 premature deaths and 620 hospital admissions in Hamilton each year.

In 1998, the Ontario Medical Association (OMA) declared air-pollution “a public health crisis.”<sup>1</sup> According to a 2005 report from the OMA, air pollution was responsible for an estimated 5,800 premature deaths, almost 17,000 hospital admissions and close to 60,000 emergency room visits in Ontario in 2005.<sup>2</sup> Severe health outcomes are, however, only the tip of the iceberg, as air pollution is also responsible for such impacts as chronic bronchitis in children as well as innumerable respiratory problems in sensitive populations such as the elderly.

**Table 1: 2005 Illness Cost of Air Pollution – (Ontario Medical Association)  
Regional Data for Hamilton-Wentworth Regional Municipality**

	Individuals in 2005	Individuals in 2026 (Projected)
Premature Deaths	290	500
Hospital Admissions	810	1,200
Emergency Visits	2,840	4,250

**According to the most recent scientific research, there is no ‘safe level’ for air pollution.**

There is no level below which there are no adverse health effects.

- GTA Clean Air Council

<sup>1</sup> Ontario Medical Association. *Beware the Air You Breathe: Ontario’s Doctors Call for Cleaner Air*, May 1998.

<sup>2</sup> Clean Air Hamilton: 2004-2005 Progress Report, May 2006.

## Natural Environment

Air pollution is harmful to the health of animals and plants. Air pollution may shift an ecosystem to become dramatically different than the one we are familiar with or dependent on.<sup>3</sup> Air pollution is considered to be the second most important stress on ecosystems and wildlife, after changes in land use.

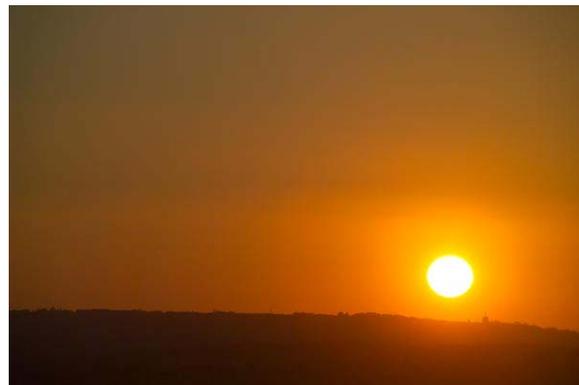
Plants impacted by ground-level ozone and acid rain caused by nitrogen oxide (NO<sub>x</sub>) and sulphur dioxide (SO<sub>2</sub>) emissions grow more slowly and can become vulnerable to disease, pests, drought and cold. Some plants and stages of plant growth (i.e., new growth) are more sensitive to air pollution than others. This is of particular concern for the agriculture sector where reduction in crop productivity or survival can have significant and detrimental impacts on the economic viability of operations.

Air pollution harms wildlife in two main ways; the quality of the habitat in which they live, and the availability and quality of their food supply. For example, acid rain deposits into lakes can cause a reduction in fish stocks, a loss of food sources for birds, and increased nutrient loads leading to eutrophication and algae blooms. These impacts reduce human enjoyment of recreational pursuits such as wildlife viewing, fishing and hunting. Moreover, toxics such as mercury can be released into the water or air and accumulate in terrestrial and aquatic animals and plants, impacting wildlife and ecosystems further.

## Economy

A 2005 Ontario Medical Association report estimated the cost of air pollution to the economy of Ontario at \$16 Billion per year. The economic impact of smog in Hamilton on individual health in 2005 was \$2.13 M in Health Care and \$1.73 M in lost productivity from employees' sickness or having to stay at home to take care of their children affected by poor air quality.

According to the GTA Clean Air Council, municipal governments have an opportunity to protect human health, save money, provide benefits to employees and citizens and meet climate change reduction goals. The Corporation of the City of Hamilton can contribute to cleaner air by taking action at the local level to reduce its emissions as owners/operators of corporate fleets, local utilities, waste and water treatment plants and through land use and transportation planning.



Clean air strategies help in the fight against climate change, as measures which promote efficient land use changes, more efficient use of fossil fuels and/or a switch to cleaner sources of energy will reduce emissions of both smog-causing and greenhouse gases.

---

<sup>3</sup> Environment Canada: Clean Air Online (accessed June 2006 online at [http://www.ec.gc.ca/cleanair-airpur/Home-WS8C3F7D55-1\\_En.htm](http://www.ec.gc.ca/cleanair-airpur/Home-WS8C3F7D55-1_En.htm))

## Climate Change Issues

Climate Change refers to the long term change in average weather patterns resulting from the release of substantial amounts of greenhouse gases (GHGs), such as carbon dioxide, methane, nitrous oxide, etc. These emissions alter the chemical composition of the atmosphere, resulting in intensification of the earth's natural greenhouse effect.

**Table 2: Key Greenhouse Gases (GHGs) and Sources**

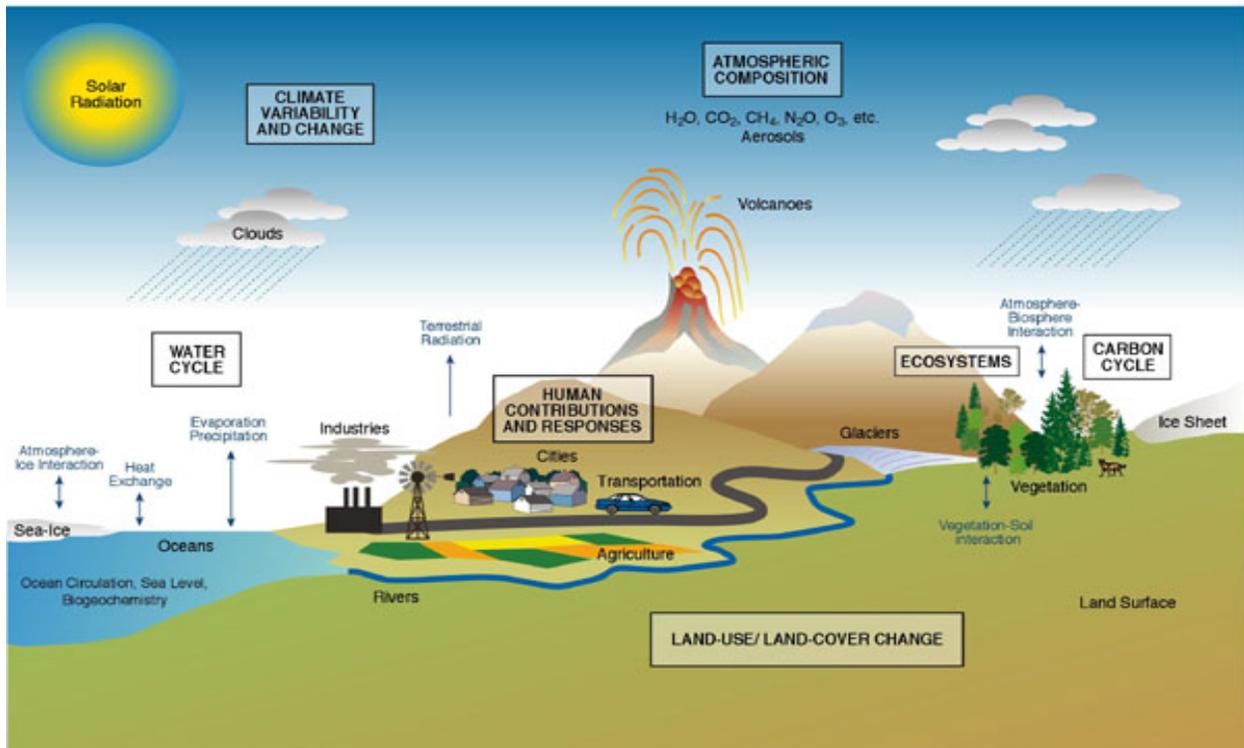
Symbol	Name	Sources
CO <sub>2</sub>	Carbon Dioxide	Fossil fuel combustion, forest clearing, cement production, etc.
CH <sub>4</sub>	Methane	Landfills, production and distribution of natural gas & petroleum, fermentation from livestock, sewage waste treatment, fossil fuel combustion, etc.
N <sub>2</sub> O	Nitrous Oxide	Fossil fuel combustion, fertilizers, nylon production, manure, etc.
HFC's	Hydrofluorocarbons	Refrigeration gases, aluminium smelting, semiconductor manufacturing, etc.
PFC's	Perfluorocarbons	Aluminium production, semiconductor industry, etc.
SF <sub>6</sub>	Sulfur Hexafluoride	Electrical transmission and distribution systems, circuit breakers, magnesium production, etc

Climate change can be caused by natural processes, such as a change in the sun's strength, and by human activities. Scientific consensus has been reached that due to increased fossil fuel use and permanent forest loss since pre-industrial times, atmospheric concentrations of greenhouse gases have grown significantly, leading to accelerated changes in our climate.<sup>4</sup> Hamilton has a high concentration of heavy industry and transportation corridors which are contributing local sources of greenhouse gases.



<sup>4</sup> Environment Canada: Climate Change (accessed May 2006 online at <http://www.ec.gc.ca/climate/home-e.html>)

**Figure 1: Major components of the climate and climate change.**



Source: *The U.S. Climate Change Science Program: Vision for the Program and Highlights of the Scientific Strategic Plan Report 2003. Overview: The Need for the Best Available Science to Address Global Climate Change Issues pg 1*

The increase of greenhouse gases in the atmosphere is bringing more than just warmer summers and milder winters. Climate change has a destabilizing effect on weather patterns, increasing the frequency and intensity of extreme weather events like heat waves, storms, and droughts, floods, blackouts, forest fires and other weather-related disasters. The summer of 2005 demonstrates the extreme weather which is likely to become commonplace in the next 50 years.<sup>5</sup>

Climate variability may increase stagnant air masses over a region, causing the build up of noxious pollutants that register as air quality concerns. Stagnant air masses are the result of high-pressure systems that bring high temperature, humid conditions and high amounts of particulate matter on their approach to Hamilton. In parts of southern Ontario, the frequency of “offensive” or “oppressive” air masses could increase 5 – 8 times current levels with climate change.<sup>6</sup>

<sup>5</sup> The Clean Air Partnership: *Adapting to Climate Change in Toronto*, 2006.

<sup>6</sup> City of Ottawa: *Air Quality & Climate Change Plan*, 2004.

**According to the GTA Clean Air Council, climate change will be accompanied by:**

- A doubling in the number of hot days (above 32°C) in the Toronto-Niagara region by the 2030's; surpassing 50 days by the 2080's.
- A longer growing season and slight increases in annual average precipitation.
- Longer periods of droughts punctuated by heavier rainstorms.
- Greater rates of evaporation and less winter ice cover, leading to lower lake levels in the Great Lakes and inland lakes and rivers.
- More favourable conditions for a number of pests (insects, vermin, etc.).
- More extreme weather events (storms, floods).<sup>7</sup>

Of equal concern are the indirect effects that climate change could have on air quality in Hamilton by affecting community energy usage. Warmer summer temperatures lead to greater use of air conditioning, and depending upon the fuel or electricity energy mix, there could be an associated increase in local and trans-boundary air emissions. The use of air conditioners and local consumption of energy also increases the urban heat island effect, accelerating smog formation with its attendant impacts on human health.



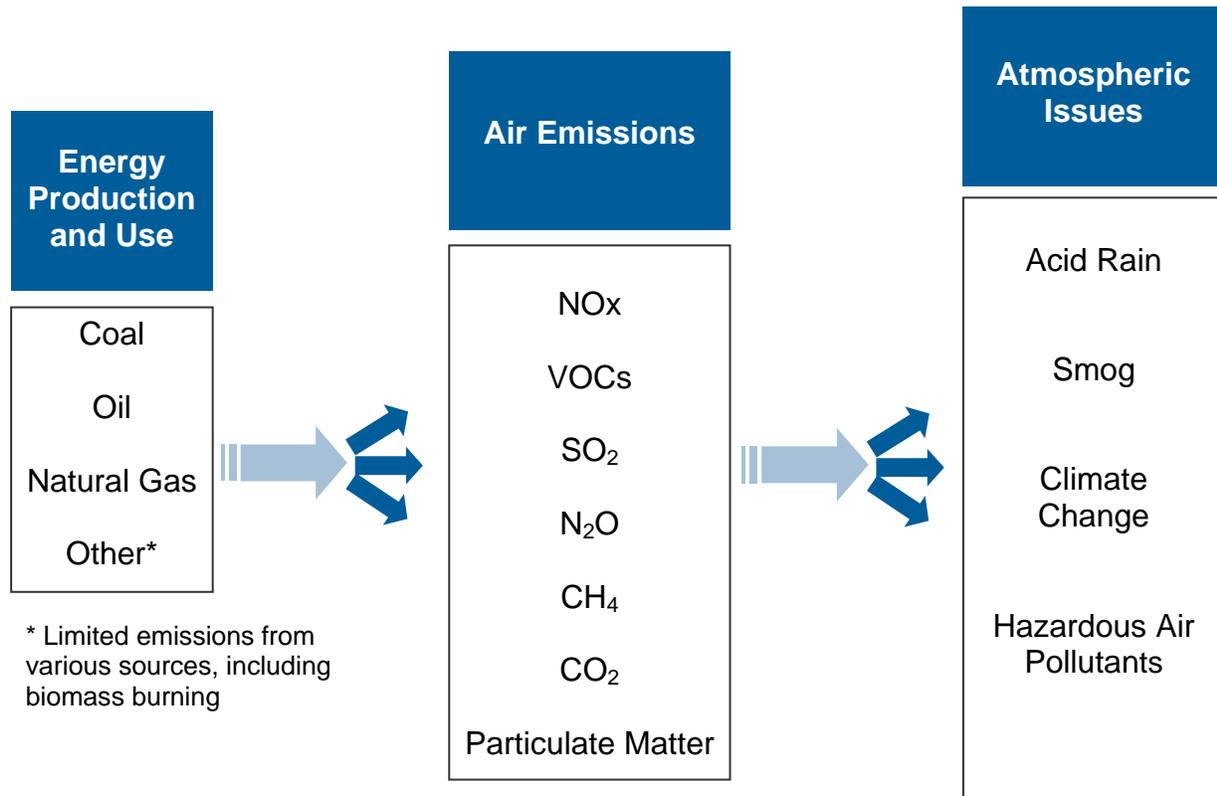
### **The Urban Heat Island Effect**

On hot summer days, cities can be up to 4 to 7 degrees Celsius hotter than their suburban and rural surroundings. This phenomenon occurs because urban development replaces trees and natural surfaces with large amounts of paved and dark coloured surfaces like roofs, roads, and parking lots that absorb, rather than reflect, the sun's heat. This causes ambient air temperatures to rise. Cars, factories and air conditioning can add more heat and pollutants to the dome of elevated temperatures that build up over a city.

Measures to reduce greenhouse gas emissions usually translate directly into local air quality benefits. This is because the focus is on reducing fossil fuel combustion, the main cause of greenhouse gas emissions, also minimizes the release of most conventional forms of air pollution. The following image illustrates the connection between air pollutants and greenhouse gases from the combustion of fossil fuels:

<sup>7</sup> GTA Clean Air Council: *A Model Clean Air Plan for the Living City*, 2005.

**Figure 2:**  
**Combustion of Fossil Fuel: Electricity, Home energy, Transportation, Industry, and Municipalities**



Source: 2003. Chiotti. Pollution Probe. Presentation to GTA Clean Air Forum. York University. Slide 7.

## Greenhouse Gas (GHG) Emissions

As a driving force of climate change, greenhouse gas emissions are a critical measure of human influence. By measuring and curbing greenhouse gas emissions, we can lessen and delay the negative impacts of climate change. For this reason, climate change strategies are focused on decreasing the emissions of greenhouse gases by direct or indirect means.

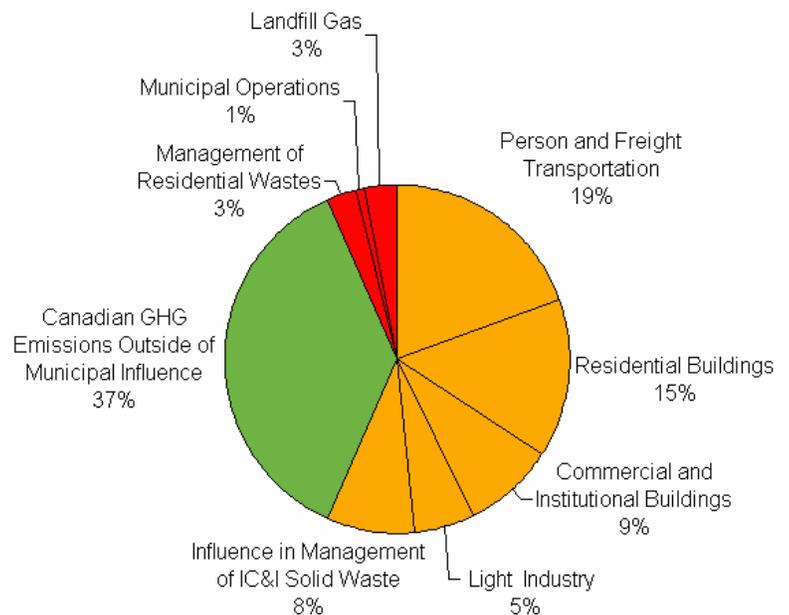
### What is one tonne of GHGs?

- The volume of one tonne of GHGs would fill a two-storey, three-bedroom house
- One metric tonne equals the weight of about 5,700 hockey pucks
- The average Canadian produces approximately 5 tonnes of greenhouse gas emissions each year so one tonne is a reduction of about 20%
- An automobile produces approximately 5 tonnes/year of CO<sub>2</sub> equivalents
- **1 Mt (mega tonne) is 1 million tonnes of carbon. 1 Mt of carbon is equivalent to 3.67 million tonnes of carbon dioxide. Carbon dioxide, the most abundant greenhouse gas produced, is used as the standard to which greenhouse gases are measured against and is referred to as CO<sub>2</sub>e.**

The Federal Government recognizes that there is strong consensus in the international scientific community that climate change is occurring and that the impacts are already being felt in some regions.<sup>8</sup> Since the 2006 election, the Government of Canada has been committed to the development and implementation of a Made-in-Canada plan for reducing greenhouse gases and ensuring clean air, water, land and energy for Canadians.<sup>9</sup> As part of this plan the new conservative government has pledged to develop a new Canadian Clean Air Act, in conjunction with the provinces and territories, municipalities and Aboriginal communities. In Ontario, the McGuinty government is investing in a wide variety of initiatives and partnerships to provide a firm scientific foundation for actions to reduce air pollution and mitigate climate change.<sup>10</sup> The Federation of Canadian Municipalities (FCM) acknowledges that municipal governments can play a critical role in reducing greenhouse gas emissions. FCM has endorsed the World Mayors and Municipal Leaders Declaration on Climate Change which commits municipal government to implementing policies and operational changes that will contribute to reducing global greenhouse gas emissions by 30 percent by 2020 and 80 percent by 2050, when compared to 1990 levels. Air Quality and Climate Change issues transcend political jurisdictions and it is the responsibility of every level of government to do all that is possible to protect the health and quality of life of their citizens through mitigation and adaptation.

Municipal governments have a critical role to play in climate protection. According to the Federation of Canadian Municipalities, up to half of Canada's greenhouse gas emissions (360 million tonnes) are under the direct or indirect control or influence of municipal governments. Municipalities directly control decisions that produce some 38 Mt of greenhouse gas emissions from municipal operations, residential waste, and landfill sites. Greenhouse gas emissions under the indirect (regulatory, public policy, and community awareness) control of municipal governments total 322 Mt.

**Figure 2:** Canadian GHG Emissions Directly & Indirectly Controlled by Municipalities Compared to Total National Emissions (1990).



Data Source: Municipalities Issue Table of Canada's National Climate Change Process. 1999. *Municipalities Table Options Paper*. December 1999. p. 18.

<sup>8</sup> Natural Resources Canada, *Climate Change Impacts and Adaptation: A Canadian Perspective*, 2004.

<sup>9</sup> Government of Canada. *Climate Change* (accessed July 2006 online at <http://www.climatechange.gc.ca/>)

<sup>10</sup> Government of Ontario, *Ontario Invests in the Science of Clean Air & Climate Change*, June 2006.

## Climate Change Impacts

According to the Federation of Canadian Municipalities (2005), Climate Change will affect the design and delivery of the following municipal operations:

- Transportation
- Public Safety
- Parks and Recreation
- Water and sewage
- Solid waste management
- Pest control
- Construction
- Municipal buildings
- Emergency Measures
- Energy Use
- Building Codes
- Land Use Planning
- Snow removal

### Health Impacts

Hotter and more variable weather will increase ozone concentrations and smog, aggravating existing heat and air pollution-related health problems. Warmer weather allows vector-borne disease carriers such as mosquitoes, ticks, and rodents to expand their range and survive the winter in larger numbers. Higher CO<sub>2</sub> levels have been shown to increase ragweed pollen and worsen hay fever.

Demand for water will increase with summers continuing to get hotter, putting pressure on Hamilton's water supply. Warmer lake water provides more hospitable environment for pathogens, degrading our drinking water source quality. Polluted sediment may be re-suspended with the necessary dredging of navigation routes as a result of dropping lake levels.

### Natural Environment

Climate change is one of the greatest global environmental concerns. Impacts on agriculture will be seen in the response of crops, livestock, soils, weeds and insects to the warmer conditions. An estimated three- to five-week extension of the frost-free season could benefit commercial agriculture in Ontario. However, it is also expected that dry soil conditions will intensify in Ontario, and may result in reduced yields<sup>11</sup>. City trees already stressed by the urban environment will be further damaged by extreme and prolonged summer heat causing drought and increased risks of pests and disease.

Water levels in Ontario's inland and Great Lakes are expected to decline, potentially affecting the quality of drinking water, the use of lakes for transportation, recreation and fishing, and the ability to generate hydroelectric power. Storm sewers and sanitary systems may not be able to deal with increased precipitation or storms. Diminished recharge of groundwater may cause small streams and wells to dry up and reduce the size of wetlands.

Harsh weather conditions – such as droughts, winter storms, floods, heat waves and tornadoes – could be more frequent and more severe across southern Ontario. Infrastructure within cities built to lesser standards increases the vulnerability of municipalities and buildings to the impacts of severe weather brought about by climate change.

---

<sup>11</sup> Government of Canada: Climate Change, (accessed April 2006 online at <http://www.climatechange.gc.ca/>)

## Economy

Significant economic impacts due to climate change are anticipated as more extreme weather events, extreme heat and smog, and intense rainstorms increase infrastructure costs and weather – related business losses associated with stormwater management, electricity generation and transmission.

Improved energy efficiency in new buildings and land use districts can dramatically reduce fuel costs while providing the same energy services, freeing up money for other programs or priorities while reducing air pollution. Many energy-efficiency investments have a pay-back period of as little as 3-5 years.<sup>12</sup>

Individuals and households that live below the poverty line have few resources (live in older housing, unable to afford air conditioning, less access to communication and information channels) to protect themselves from weather extremes or natural disasters. Recovery from disasters is more difficult for low-income households that have limited or no insurance coverage or savings.

## The Municipality's Role

Municipalities have an important role to play in improving air quality and retarding climate change given their legislated powers and the types and level of services they provide citizens, including public works, planning, and health services.

Municipalities are in a position to make improvements in local air quality and reduce greenhouse gas emissions. Not only can local governments take corporate action by reducing energy consumption in municipal operations, but they also have a wide range of tools to encourage all other sectors within their jurisdiction to take action on air quality and climate change.

Regulatory tools, including urban growth policies, by-laws, zoning, building and development permits, licenses, and standards are commonly used to influence community activities.

Local governments can motivate action in the community by demonstrating leadership in their operations, through standards and policies for municipal developments. Such as the use of fiscal incentives, reduced transit pass costs to employees, or subsidies to tree planting programs for homeowners. Hamilton has had a Smog Alert Response Plan since 1999 for reducing emissions in municipal operations during periods of poor local air quality. In 2004 the City adopted an idling policy for its operations of corporate fleets.

Local governments can engage the community in education and awareness initiatives. Educational initiatives not only promote community action, but are also important when implementing a wide range of programs in municipal operations. Hamilton has already formed partnerships with some local environmental organizations to support education activities. The tree planting and Commuter Challenge programs are examples of community engagement, education and awareness of air quality and climate change issues.

---

<sup>12</sup> Natural Resources Canada, Office of Energy Efficiency (accessed May 2006 online at <http://oee.nrcan.gc.ca/>)

By 2012, the Federation of Canadian Municipalities estimates that communities could cut greenhouse gas emissions by 20 to 50 Mt from municipal operations and community-wide initiatives with investments in environmental infrastructure and sustainable transportation infrastructure. Municipal governments can reduce emissions through:

- land-use, energy, and transportation planning;
- infrastructure design;
- green procurement;
- building retrofits;
- water conservation;
- solid waste diversion; and
- renewable energy.

Measures such as enhancing the use of cleaner fuels, community transportation demand management and community greening all have important environmental, health, economic and quality of life benefits, worth pursuing even if climate change were not an issue. Indirect benefits to the community may even exceed the direct ones. These include savings involved in converting commuters from their cars to transit, representing major savings in insurance, road repair, and vehicle maintenance. Reducing the reliance by both the City and its citizens on oil and gas at a time when the cost of this fuel can increase is another major gain. Controlling urban sprawl through compact urban design, greenspace preservation, and promoting intensification and re-urbanization reduces the need for roads and salt as well as promotes a healthy lifestyle through increased walking and cycling. The greatest benefit of reducing greenhouse gases and air pollutants is likely the positive impact of the resulting cleaner air on our health and that of our ecosystem.

## PART 2 – Action Plan

### City of Hamilton Actions on Air Quality & Climate Change

The quality of air we breathe is important to the public. The ability to live in a breathable city is of added value to families and communities. The City of Hamilton has recognized this since the early 1990s and has advocated this important community indicator through Vision 2020 and by supporting local groups engaging in the issues of air quality and climate change such as Clean Air Hamilton and Green Venture.

#### **VISION 2020 Goals for Air Quality and Climate Change:**

*To ensure the City has the best air quality of any major urban centre in Ontario;*

*To have effective plans that identify, reduce and manage risks; and,*

*To reduce greenhouse gas emissions (20 percent of 1994 levels in municipal operations and six percent of 1994 levels City-wide).*

The following highlights some of the actions that the City of Hamilton has undertaken to address air quality and climate change;

- In 1992 adopts the Vision 2020 Strategy and in 1993 establishes a goal for air quality “ to ensure the City (Region) has the best air quality of any major urban center in Ontario”
- Becoming a signatory to the Canadian Declaration on Climate Change and the Urban Environment in 1995.
- Members of the Federation of Canadian Municipalities (FCM) 20% Club since 1996, which provided a forum for municipal governments to demonstrate leadership on climate change and share knowledge and experience with other municipal governments. The FCM 20% Club became Partners for Climate Protection in 1999;
- Conducting an Air Quality Initiative Study of the region to identify priorities in air quality management and makes recommendations related to air quality initiatives in 1996 and commits to reducing carbon dioxide emissions in Hamilton-Wentworth by 20%.
- Hamilton Wentworth Air Quality Initiative (HAQI) formed in 1997, and transforms into Clean Air Hamilton in 1998. City supports and member of Clean Air Hamilton.
- In 1999, the City (former Region) completed partial inventories to determine CO<sub>2e</sub> emissions (CO<sub>2e</sub> is a measure of all greenhouse gases, such as nitrous oxide and methane, adjusted to equivalent CO<sub>2</sub> units) from municipal operations and activities. Emissions were determined for the baseline year of 1994 and for 1998.
- Prior to amalgamation, the Region had a Climate Change Action Plan (1997) and the City of Hamilton had a Greenhouse Gas Reduction Program (1999). The Climate Protection Action Plan (ENV95002 (C)) for Regional operations included programs and activities in waste management, transportation, energy and land use.

- Hosting the first biennial Upwind Downwind conference that provides a forum for dialogue on air quality and health issues in 2000. Conference continues in 2002, 2004 and 2006.
- Helps establish the Hamilton Air Monitoring Network (HAMN) in partnership with the Ministry of Environment in 2001.
- Endorsing the Model Resolution by Municipal Governments to ratify the Kyoto Protocol in 2002.
- Renews Vision 2020 strategy (with climate change component) in 2003.
- Launching an on-line City Action Inventory under the Vision 2020 Strategy that includes actions on air quality and climate change.
- Achieving two of the milestones in the Climate Change Partnership Campaign.

The Climate Change Partnership Campaign has 5 milestones:

1. Creating a greenhouse gas emissions inventory and forecast;
2. Setting an emissions reductions target;
3. Developing a local action plan;
4. Implementing the local action plan or a set of activities; and
5. Monitoring progress and reporting results.

Milestones can be implemented either in numeric order or in the order that is most appropriate for the community. While many municipal governments start by completing a greenhouse gas inventory, others have moved immediately to actions aimed at reducing greenhouse gas emissions.

The following proposed Corporate Air Quality and Climate Change Strategic Plan process seeks to fully address all 5 milestones and build upon the milestones Hamilton has achieved.

This report will highlight some of the actions the City has or will undertake to provide examples to the action categories and areas recognized under a Corporate Air Quality and Climate Change Strategic Plan.

## **The Triple Bottom Line & Air Quality and Climate Change**

The reduction of air pollutants and greenhouse gas emissions affect all three “bottom lines” of sustainability – economy, environment and social. Reductions that help retard climate change and improve air quality have other social/health, economic and environmental benefits to the community.

Efforts to reduce air pollutants and greenhouse gas emissions from municipal operations could produce economic benefits for the Corporation and improve the quality of life in the City. They could produce energy and operating costs savings, encourage renewal of physical assets, and improve the delivery of municipal services.

# Corporate Air Quality and Climate Change Strategic Plan

City Departments currently deliver a variety of policies and programs that address air quality and climate change. Some have been expressly created for that purpose, while many others make a direct contribution to air quality and climate change issues as they pursue other goals. A clear, coherent strategy is needed to bring the current policies and programs together and translate corporate effort to more effectively address both air quality and climate change by a strategic action plan.

The undertaking of a Corporate Air Quality and Climate Change Strategic Plan will involve two phases. Phase I is the identification of the strategic directions and the roles and responsibilities of City Departments with respect to air quality and climate change. This is represented in this report. Phase II will be the implementation details and specific actions of the long –term Plan (highlighted briefly in Category V of the Plan) which will follow Phase I.

The key objectives of Phase I through this report are;

- Identify current and future activities and directions within the Corporation that address air quality and/or climate change.
- Clarify the City’s corporate and community leadership roles in air quality and climate change issues, and Departmental relationships and dependencies.
- Organize the scope and direction of activities by the City, in a strategic manner, to address air quality and climate change.
- Develop a framework model of actions by the City to address air quality and climate change.
- Engage City Departments on actions and reinforce and expand their activities.
- Define roles and responsibilities of Departments and encourage partnerships within and outside the Corporation.
- Make recommendations to implement the Air Quality and Climate Change Plan by the Corporation.

The Corporate Air Quality and Climate Change Strategic Plan consists of 5 action categories that summarize the main functions that any organization, department or group would become involved with to address air quality and climate change issues. These are;

- I. Research that Informs Policies and Strategies;**
- II. Response, Engagement & Communication;**
- III. Adaptation to Smog & Climate Change;**
- IV. Reducing Emissions, Key Pollutants & Greenhouse Gases; and;**
- V. Delivering Air Quality and Climate Change Programs.**

The report provides examples of associated City actions, policies and programs that address the action categories. The report defines City Departments that may serve as corporate leads to the needs of the proposed plan's action categories and identifies Departments that play a supportive role to each category's actions either due to their mandate or ability to respond to identified issues.

The 5 action categories of the proposed plan should not be considered as separate. Information must flow amongst and between categories to ensure activities by the City and Departments under each area are efficient, effective and continuously improved upon through knowledge sharing.

**Appendix A** contains a chart that outlines and visualizes the structure of the Corporate Air Quality and Climate Change Strategic Plan. This chart is a framework model of the Plan and should be consulted when reading this report.

## Corporate Roles and Responsibilities

The identified action categories of the Corporate Air Quality and Climate Change Strategic Plan require corporate leadership in order to co-ordinate responses amongst Departments within the Corporation and ensure activities are in line with the direction of the Air Quality & Climate Change Plan.

The following tables identify City Departments that could best serve the corporate leadership role of each action category. Departments that can support and address specific areas under the respective action categories are also noted.

It is not expected that the Departments identified as “corporate leaders” under each action category be responsible for knowledge on every issue under their respective action category. Corporate leaders are encouraged to direct responses and actions to address specific air quality and climate change issues outside their realm of knowledge to those Departments whose actions, under their mandate and main function, address the specific air quality and climate change issues identified.

For example, the Planning and Economic Development Department can undertake research on overall air quality and climate change issues, but cannot undertake specific research related to issues of energy management or tree planting or respond to enquiries on those topics, but would refer research and response to Public Works. Similarly Public Works could not be expected to respond to an enquiry on Disease Vectors or Smog Alerts, but would refer response to Public Health.

	Lead Department	Roles & Responsibilities	
<b>I</b> <b>Research That Informs Policies &amp; Strategies</b>	<b>Planning &amp; Economic Development</b>	Air Quality & Climate Change: <ul style="list-style-type: none"> <li>Data Collection, Information Gathering, Analysis &amp; Modeling</li> <li>Policy Analysis</li> <li>Risk Management</li> </ul>	
		<b>Supporting Departments</b>	
		<b>Public Health</b>	<ul style="list-style-type: none"> <li>Health effects &amp; impacts</li> <li>Disease Vectors</li> </ul>
		<b>Public Works</b>	<ul style="list-style-type: none"> <li>Risk management</li> <li>Infrastructure</li> <li>Fleet Greening</li> <li>Waste Management &amp; Reduction</li> <li>Operations</li> <li>Energy Management</li> </ul>
		<b>Stakeholders</b> Clean Air Hamilton & Climate Change Advisory Committee	<ul style="list-style-type: none"> <li>Data Collection &amp; Policy Analysis</li> </ul>

	Lead Department	Roles & Responsibilities	
<b>II</b> <b>Response, Engagement &amp; Communication</b>	<b>Planning &amp; Economic Development</b>	<ul style="list-style-type: none"> <li>Responding to community concerns</li> <li>Responding to external development proposals</li> <li>Responding to regulatory proposals</li> <li>Responding to internal policy input requests</li> <li>Communicating and promoting actions</li> </ul>	
		<b>Supporting Departments</b>	
		<b>Public Works</b>	<ul style="list-style-type: none"> <li>Responding to regulatory proposals</li> <li>Responding to external development proposals</li> <li>Responding to internal policy input requests</li> </ul>
		<b>Public Health</b>	<ul style="list-style-type: none"> <li>Responding to regulatory proposals</li> <li>Responding to internal policy input requests</li> </ul>
		<b>All Departments</b>	<ul style="list-style-type: none"> <li>Responding to community concerns</li> <li>Responding to internal policy input requests</li> <li>Communicating and promoting actions</li> </ul>

	Lead Department	Roles & Responsibilities	
<b>III</b>  <b>Adaptation to Smog &amp; Climate Change</b>	<b>Public Health (Smog Response)</b>	<ul style="list-style-type: none"> <li>▪ Smog Alert (Smog Response Plan)</li> <li>▪ Corporate Response</li> <li>▪ Community Response               <ul style="list-style-type: none"> <li>○ Avoid Exposure</li> </ul> </li> </ul>	
		<b>Supporting Departments</b>	
		<b>All Departments</b>	<ul style="list-style-type: none"> <li>▪ Implement actions laid out in Corporate Smog Response Plan</li> </ul>
	<b>Public Works (Climate Change Adaptation)</b>	<ul style="list-style-type: none"> <li>▪ Extreme Weather Events</li> <li>▪ Water Quality &amp; Supply</li> <li>▪ Built Environment</li> <li>▪ Tree Planting &amp; Preservation</li> </ul>	
		<b>Supporting Departments</b>	
		<b>Public Health</b>	<ul style="list-style-type: none"> <li>▪ Cold/heat alerts, disease vectors</li> </ul>
<b>Emergency Services</b>		<ul style="list-style-type: none"> <li>▪ Emergency Response</li> </ul>	

	Lead Department	Roles & Responsibilities	
<b>IV</b>  <b>Reducing Emissions, Key Pollutants &amp; Green House Gases</b>	<b>Public Works</b>	<ul style="list-style-type: none"> <li>▪ Fleet Greening</li> <li>▪ Transportation Demand Management</li> <li>▪ Energy Management</li> <li>▪ Land Use &amp; Transportation Planning</li> <li>▪ City Operations</li> <li>▪ Waste Management &amp; Reduction</li> <li>▪ Idling Control</li> </ul>	
		<b>Supporting Departments</b>	
		<b>Planning &amp; Economic Development</b>	<ul style="list-style-type: none"> <li>▪ Land Use &amp; Transportation Planning               <ul style="list-style-type: none"> <li>○ Compact Urban Form</li> <li>○ Preservation of Green Space</li> <li>○ Urban Design</li> </ul> </li> </ul>
		<b>Corporate Services</b>	<ul style="list-style-type: none"> <li>▪ Purchasing &amp; Procurement</li> </ul>

	Lead Department	Roles & Responsibilities	
<b>V</b> <b>Program Delivery</b>	<b>Public Works</b>	<ul style="list-style-type: none"> <li>Identifying Responsibility of the Plan</li> <li>Creating Internal Collaboration Reporting &amp; Structure for the Plan</li> <li>Monitoring &amp; Evaluation of the Plan</li> </ul>	
		<b>Supporting Departments</b>	
		<b>All Departments Interdepartmental Working Group</b>	<ul style="list-style-type: none"> <li>Ensuring Regulatory Compliance</li> <li>Internal Collaboration</li> <li>Identifying Alternative Service Delivery Opportunities</li> <li>Monitoring &amp; Evaluation of Programs &amp; Plan</li> </ul>
		<b>Stakeholders Climate Change Advisory Committee &amp; Clean Air Hamilton</b>	<ul style="list-style-type: none"> <li>Implementation</li> </ul>

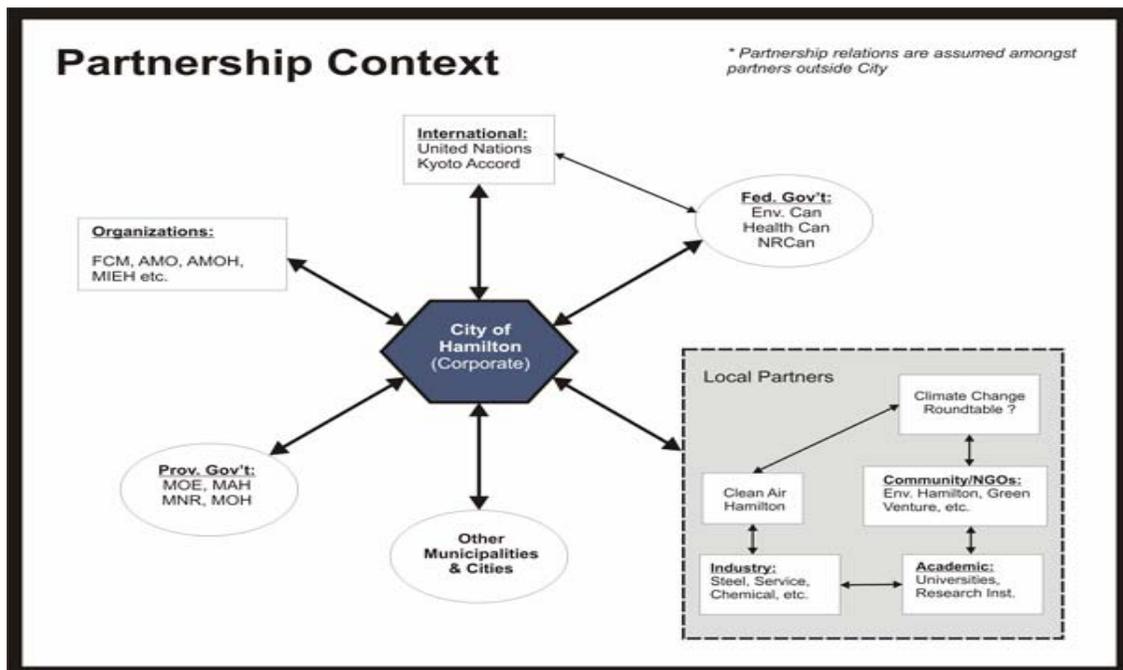
## Interdepartmental Working Group

An Inter-Departmental Air Quality and Climate Change Work Group would be formed that would co-ordinate and be responsible for the actions of the corporation to address air quality and climate change and serve as a clearing house to disseminate information on corporate actions and priorities regarding air quality and climate change. Representatives of the group would be from the Departments (Planning & Economic Development, Public Works, Public Health) within the Corporation who can engage and promote actions to reduce air pollutants and greenhouse gases and adapt to climate change within City operations, policies and programs. The Inter-Departmental Air Quality and Climate Change Working group would support the Corporate Leads.

## Partnerships

The Corporate Air Quality and Climate Change Strategic Plan is not an isolated plan or effort. It is dependent upon and supports activities undertaken by community partners outside of the Corporation. Such partners include international and non-governmental organizations, the federal and provincial government, the Federation of Canadian Municipalities, the Association of Ontario Municipalities, the Ontario Medical Association, the Ontario Professional Planners Institute, the Canadian Climate Impact and Adaptation Research Network, other municipalities, community groups such as Clean Air Hamilton, Green Venture, Environment Hamilton, the Hamilton Community Foundation, local industries and academics. The activities that each of these partners have or will undertake with regards to air quality and climate change also influence and shape the delivery of the City's action strategies on Air Quality and Climate Change.

**Figure 3:** Partnerships in Air Quality and Climate Change within and beyond Hamilton



**Local actions on clean air and climate change and successful cooperation among community members, industry and all levels of government are essential for reducing air pollutants and greenhouse gases.**

## I Research that Informs Policies & Strategies

Research helps an organization identify and focus its role in issues, assess what actions it can undertake directly through its operations and services and influence others to take action that support its priorities.

The purpose of research in the Corporate Air Quality and Climate Change Strategic Plan is to review new information and monitor trends on the impacts of air quality and climate change, and to develop, and assess corporate policies and programs that need to respond. Greater knowledge within the organization on issues of air quality and climate change is always required, as well as ensuring that the knowledge developed or identified by parts of the organization is shared amongst Departments.

**The transfer of knowledge amongst Departments will keep air quality and climate change activities both relevant and current based on the available research on the topics of air quality, climate change, public health and climate impacts.**

The Government of Canada reports that Canadians can expect to see many changes to personal and community risks as a result of climate change.<sup>13</sup> Risk management is necessary in informing the actions that the City can undertake to address air quality and climate change impacts. Research in these areas helps in the development of “effective plans that identify, reduce and manage risks”; a goal of Hamilton's Vision 2020 Strategy.

Risk management is the process of assessing risk and then developing strategies to manage that risk. Risk management helps organizations avoid “nasty surprises” while allowing for adaptability in responses to the impacts of a changing climate. Information gathered through research and partnerships can inform decisions that respond to risk. Risks associated with air quality or climate change should not be addressed in isolation. They need to be integrated in a more holistic risk management strategy while recognizing the dynamic nature of climate-related risks.

The Corporation does not often undertake original research into air quality and climate change due to resources and mandate, however partnerships with governments, academics and organizations such as Clean Air Hamilton assist in the obtaining of factual knowledge on air quality and climate change issues.

---

<sup>13</sup> Natural Resources Canada: *Climate Change, Impacts & Adaptation: A Canadian Perspective*, 2005.

## Air Quality

Clean Air Hamilton works to improve air quality by initiating research on local air quality issues and providing policy advice to government. Since 1992, Clean Air Hamilton has hosted a biennial conference on issues of air quality, health and planning known as the Upwind Downwind Conference. This conference provides a forum for improved understanding of air quality issues and human health impacts related to issues of urban cities and transportation. The conference highlights the roles that industry, community groups and governments can play in achieving air quality improvements. The conference generates many ideas and is an excellent opportunity for Hamilton and other communities to share practical solutions to air quality problems.

The City also joined the Greater Toronto Area (GTA) Clean Air Council in 2005 to participate in a dialogue on air quality with other municipalities in southern Ontario. The Greater Toronto Area Clean Air Council is an intergovernmental working group that promotes the reduction of air pollution emissions and increased awareness of Regional air quality issues through the collective efforts of all levels of government.

## Climate Change

Research into climate change and its potential impacts on Hamilton requires on-going information gathering and dissemination to enhance learning by the Corporation and the community, understand the types of actions that can be undertaken to reduce emissions and adapt to smog and climate change.

Engagement and research on climate change is now a primarily a partnership with other levels of government, organizations, municipalities, local industries, academics and community groups. A proposed first step in formalizing these partnerships is the undertaking of a round table community forum which may lead to the formation of an equivalent advisory organization to Clean Air Hamilton, focussed on climate change issues.

The forum could raise awareness of climate change in Hamilton, create dialogue amongst groups, assist in the creation of a Climate Change Advisory Committee for the City.

By taking advantage of the research undertaken by other organizations, and consulting people and groups within the City of Hamilton, a more focussed and coherent set of air quality and climate change policies and strategies can be developed by the Corporation and the City's community partners. Keeping informed of continued research and program activities will help the City maintain its policies and strategies and keep them relevant to the issues and impacts of air quality and climate change.

## Departmental Roles & Responsibilities:

Within the Planning and Economic Development Department resides the “Air Quality Co-ordinator” for the City of Hamilton and Clean Air Hamilton. The Planning and Economic Development Department, through the role of the Air Quality Co-ordinator, can co-ordinate the gathering of research from partners on overall issues of air quality and climate change. The City’s Air Quality Co-ordinator already serves the role of supporting Clean Air Hamilton in their research on air quality and health and responds to external enquiries and proposals that impact local air quality. The role of the Co-ordinator could be expanded to gather research on climate change with the support of a Climate Change Advisory Committee, similar to Clean Air Hamilton.

However, specific research topics that fall under the current mandate and/or activities or functions of other Departments - such as public health, waste management, and infrastructure will remain the responsibility of those Departments.

	Lead Department	Roles & Responsibilities
<b>I</b> <b>Research That Informs Policies &amp; Strategies</b>	<b>Planning &amp; Economic Development</b>	Air Quality & Climate Change: <ul style="list-style-type: none"> <li>▪ Data Collection, Information Gathering, Analysis &amp; Modeling</li> <li>▪ Policy Analysis</li> <li>▪ Risk Management</li> </ul>
		<b>Supporting Departments</b>
		<b>Public Health</b> <ul style="list-style-type: none"> <li>▪ Health effects &amp; impacts</li> <li>▪ Disease Vectors</li> </ul>
		<b>Public Works</b> <ul style="list-style-type: none"> <li>▪ Risk management</li> <li>▪ Infrastructure</li> <li>▪ Fleet Greening</li> <li>▪ Waste Management &amp; Reduction</li> <li>▪ Operations</li> <li>▪ Energy Management</li> </ul>
		<b>Stakeholders</b> <b>Clean Air Hamilton &amp; Climate Change Advisory Committee</b> <ul style="list-style-type: none"> <li>▪ Data Collection &amp; Policy Analysis</li> </ul>

## II Response, Engagement & Communications

The Corporation provides many services to the citizens of Hamilton that involve information services such as responding to enquiries on plans, policies, programs, projects and disseminating community education materials and programs.

The Corporate Air Quality and Climate Change Strategic Plan will need to respond to enquiries and proposals from a variety of interests (e.g. public, internal Departments, different levels of government, international activities, industry, stakeholders, etc.). These differing interests influence how actions undertaken by the Corporation address air quality and climate change.

Activities undertaken by the Corporation on air quality and climate change will need to:

- 1) Respond to the community and to internal staff or Department concerns regarding air quality and climate change issues that impact the economy, health and environment of Hamilton.

The City Air Quality Co-ordinator responds to public and internal policy requests regarding issues of air quality and co-ordinates with City Departments on requests regarding specific City programs and air quality. This function will continue to serve in the City to address Hamilton's air quality needs. However engagement of climate change awareness and responses by and within the Corporation is required.

With respect to the Corporate Air Quality and Climate Change Strategic Plan, the Air Quality Co-ordinator can assist in the co-ordination of efforts and information regarding air quality and climate change to other internal Departments through a proposed internal working group and a Climate Change Advisory Committee.

Public Health responds to concerns of the health of the citizens of Hamilton and engages citizens in healthy lifestyle, health protection and health promotion through education and the delivery of public health programs. Public Health will continue in this role under the Corporate Air Quality and Climate Change Strategic Plan, but would expand its role to respond and deliver Smog Advisories. Cold alerts and information on health impacts of climate change and air quality such as disease vectors would remain unchanged.

The Public Works Department responds to enquires regarding public operations and services such as transit, road services, water and wastewater treatment; water distribution; stormwater and drainage; solid waste collection and disposal; recycling; street access and street lighting; traffic control; road/water/sewer infrastructure; environmental approvals; Park's operation and maintenance; and forestry including street tree planting. The Public Works Department would continue to respond to enquiries regarding public operations and services under the Corporate Air Quality and Climate Change Strategic Plan.

Corporate Services runs the Customer Contact Centre that serves as a portal to public enquiries and information on municipal services. City Clerks processes official correspondence to and from City Council and can also serve as a general information office to the public on a wide range of enquiries. Air quality and climate change information and/or corporate contact information should be made available to these venues for the public.

- 2) Respond to external policies (e.g. federal, provincial, other municipalities) and regulations that will influence the Corporation's operations and to ensure local compliance.

The Canadian Environmental Protection Act, the Canadian Environmental Assessment Act, the Canada-United States Air Quality Agreement, the Provincial Environmental Protection Act, The Provincial Policy Statement, Ontario's Anti-Smog Action Plan, the Memorandum of Understanding for Cooperation on Addressing Climate Change, Ontario Conserves are all examples of some of the current policies or regulations that the Corporation needs to consider in its operations and services that relate to air quality and climate change issues. The City needs to effectively engage other organizations and government in future policies and regulations that affect its air quality and climate change objectives and actions.

- 3) Respond to external project development and planning proposals that may impact the local airshed and climate of Hamilton. A consideration of air quality and climate change impacts resulting in changes in infrastructure and operations, leading to adaptation, is advised under the decision-making and approvals context.
- 4) Communicate and promote the actions that the Corporation is undertaking to address air quality and climate change. The promotion and communication on the activities that the Corporation and City undertake to address the impacts of air quality and climate change is important to educate the community on City initiatives, but also to create dialogue and encourage partners in developing similar programs within their communities. Under the Corporate Air Quality and Climate Change Strategic Plan, individual Departments will be responsible for promoting their own respective programs and policies and educating the public. However, in the implementation of a City Wide Air Quality and Climate Change Action Plan, an annual progress report could be developed similar to the City's Waste Reduction and Vision 2020 Indicators Reports. This type of reporting should be considered in the Phase II of the Plan.

## Departmental Roles & Responsibilities:

The Planning and Economic Development Department, through the role of the Air Quality Co-ordinator, can lead the responses to enquiries from the public, as well as promote City actions, with regards to air quality and climate change in Hamilton by continuing to be a point of City contact. The Air Quality Co-ordinator, where required, will co-ordinate with and assist City Departments in responses where specific action enquiries such as tree planting requests, energy programs and transportation are made.

Individual Departments will still be responsible for responding to enquiries and/or proposals on specific programs that may impact on air quality or climate change that fall under their mandate and/or activities or functions. They will also be responsible for the promotion and marketing of their individual actions.

Individual Departments are responsible for complying with relevant legislation which influences their mandates and actions, and the Air Quality Co-ordinator, within the Planning and Economic Development Department, can disseminate emerging legislation and policies with regards to overall air quality and climate change to Departments.

<b>II</b> <b>Response, Engagement &amp; Communication</b>	Lead Department	Roles & Responsibilities	
	<b>Planning &amp; Economic Development</b>		<ul style="list-style-type: none"> <li>▪ Responding to community concerns</li> <li>▪ Responding to external development proposals</li> <li>▪ Responding to regulatory proposals</li> <li>▪ Responding to internal policy input requests</li> <li>▪ Communicating and promoting actions</li> </ul>
		<b>Supporting Departments</b>	
		<b>Public Works</b>	<ul style="list-style-type: none"> <li>▪ Responding to regulatory proposals</li> <li>▪ Responding to external development proposals</li> <li>▪ Responding to internal policy input requests</li> </ul>
		<b>Public Health</b>	<ul style="list-style-type: none"> <li>▪ Responding to regulatory proposals</li> <li>▪ Responding to internal policy input requests</li> </ul>
	<b>All Departments</b>	<ul style="list-style-type: none"> <li>▪ Responding to community concerns</li> <li>▪ Responding to internal policy input requests</li> <li>▪ Communicating and promoting actions</li> </ul>	

The next two categories of the Corporate Air Quality and Climate Change Strategic Plan emphasizes the role that the City can undertake in educating and motivating action by citizens and employees on improving air quality and retarding climate change.

### III Adaptation to Smog & Climate Change

**Adaptation is not mitigation. Mitigation involves actions meant to avoid or delay the occurrence of climate change. Mitigation is addressed under category IV Reducing Emissions, Key Pollutants and Greenhouse Gases.**

Adaptation covers all actions aimed at addressing the impacts of air pollutants and climate change. Adaptation can involve taking actions to modify existing facilities, structures, services, and operations to minimize the impacts and disruptions caused by air pollutants and climate change.

According to the International Panel on Climate Change (2001) adaptation is a necessary part of climate change mitigation. The corporate reality is not if, but when and how much adaptation should be made. Adaptation has the potential to reduce adverse impacts and to enhance beneficial impacts. Adaptation actions could incur costs and may not prevent all damages, however variability, and rates of change are all key features in addressing adaptation to climate change, not simply changes in average climate conditions.

At the municipal level, efforts to manage climate-related risks have not kept pace with the challenges. Canadian communities are vulnerable to hazards associated with climate variability and change, and without appropriate adaptation responses, their vulnerabilities to risk will surely increase.<sup>14</sup>

**Adaptation, in preparing for actual or expected events, does not need to be dramatic or disruptive but can include minor changes to already established activities and practices within an organization.**

Adaptation includes technical adaptation (e.g. alternative sources of energy, or new technology that reduces greenhouse gas emissions); environmental adaptation (e.g. responding to the changing structure of natural systems such as water, air, forests, and land); and social adaptation (e.g. changes in the use of transportation, land use, and personal behaviour).

Adaptation to climate change and air quality must be considered in light of all other corporate risks to better adapt to changing variables.

---

<sup>14</sup> Canadian Climate Change Impacts & Adaptation Research Network (accessed online at <http://www.c-ciarn.ca/>)

## Smog Response

The Corporate Smog Response Plan is an example adapting to the recurrence of smog during the summer season. A network of City Departments engages Ministry of the Environment Smog Alerts within the Corporation and to our external citizens. Departments include Planning & Economic Development, Public Health Services, and the City Manager. Corporate Departments such as Public Works, Planning and Economic Development, Community Services, Emergency Services, and Human Resources respond by ensuring appropriate program modification actions, outlined in the departmental smog response, are undertaken to reduce activities that release further smog precursors or aggravate health effects on employees and citizens.

Although the Corporate Smog Response Plan is more responsive to the Ministry of Environment issued smog alerts in the summer, ultimately the corporate response and departmental operating procedures should be undertaken throughout the year. Smog is no longer a summer phenomenon. Recent Smog Advisories (October 2004 and December 2005) for Hamilton are evidence that a broader and more frequent process of adaptation is required from the corporation.

### Smog - Departmental Roles & Responsibilities:

Public Health is the lead Department on adaptation activities to Smog. The mandate of Public Health is to protect the health of local citizens. Public health already educates and engages citizens in Hamilton on health related issues of water quality, disease and food safety. Air pollution is considered a threat to public health by health organizations (OPHA, OMA etc.) and the Ministry of Environment.

#### City Departments with a role in adapting to smog include:

- Public Health (Lead Department)
- Planning and Economic Development (Support)
- Public Works (Support)
- Corporate Services (Support)

Hamilton's Public Health would be able to deliver a smog response program that would advise and engage changes in behaviour by citizens on an on-going basis. The Planning and Economic Development, Corporate Services and Public Works Departments would support Public Health in the implementation of adaptation responses to smog as the communication network is already established and actions are undertaken in city operations to reduce activities during smog days under the Corporate Smog Response Plan. Public Health could also improve smog advisories by linking smog advisories to hot weather and thereby combining advice and education to the public regarding health issues of air quality and heat safety.

	Lead Department	Roles & Responsibilities
<b>III</b> <b>Adaptation to Smog &amp; Climate Change</b>	<b>Public Health (Smog Response)</b>	<ul style="list-style-type: none"> <li>▪ Smog Alert (Smog Response Plan)</li> <li>▪ Corporate Response</li> <li>▪ Community Response                             <ul style="list-style-type: none"> <li>○ Avoid Exposure</li> </ul> </li> </ul>
		<b>Supporting Departments</b>
	<b>All Departments</b>	<ul style="list-style-type: none"> <li>▪ Implement actions laid out in Corporate Smog Response Plan</li> </ul>

## Climate Change Adaptation

Adapting to climate change needs to understand the potential impacts and effects of climate variability and the risks. All corporate actions need to incorporate an element of preparation and risk protection of citizens that the Corporation cannot directly control but can still prepare for. Potential areas of corporate policy and program attention for climate change include: extreme weather events, disease vectors, water quality and supply, the built environment, and tree planting and preservation.

### Extreme Weather Events

The International Panel on Climate Change has projected that climate change will increase the number and intensity of extreme weather events that give rise to heat waves, droughts, floods, extreme snowfalls, run off and soil erosion.

Increasing temperatures will lead to changes in wind patterns, the amount and type of local precipitation, and the types and frequency of severe weather events that may be expected to occur. Such climate change has far-reaching and/or locally unpredictable environmental, social and economic consequences.<sup>15</sup>

The Government of Canada (2005) reports that Canadians can expect to see many changes to climate-related risks in their lifetimes. These include:

- More severe weather events, including thunderstorms, heavy rains, hail, and tornadoes.
- Increased landslide/avalanche activity
- Increased magnitude flooding of inland infrastructure
- Changing levels of water tables resulting in flooding, erosion, droughts and storm surges

Recent events such as the BC forest fires (2003), the Prairie drought (2004), and the Eastern Ontario/Quebec ice storm (1998) have demonstrated unusual weather related impacts that show how vulnerable Canadian communities are to the wide-ranging social and economic impacts of weather extremes and variability.

Hamilton will not be exempt from the effects of climate change. The City's 2004 Environmental Scan points out that "research indicates that future weather patterns in Southern Ontario will fluctuate to an increasing degree. Adverse weather conditions will become more intense and less predictable." For example Hamilton experienced a tornado in 2005 that tore off roofs, toppled trees in areas of Hamilton and knocked Lawfield Middle School off its foundations. Hamilton has approached the Ontario Disaster Relief Assistance Program in the past with regards to the tornado and other sources of widespread flooding.

The Ontario Emergency Management Act (EMA), amended in 2003 outlines the responsibilities of local/municipal and provincial government in the mitigation and management of emergency situations. It requires all Ontario municipalities to develop comprehensive, risk-based emergency management programs based on planned emergency prevention, preparedness, response and recovery.

---

<sup>15</sup> Government of Canada: Climate Change (accessed April 2006 online at <http://www.climatechange.gc.ca/>)

The City of Hamilton Emergency Management Program has been developed and managed since the 1990's. The Program may present an opportunity to further address risks of weather related events resulting from climate change.

Bitter cold and severe winter storms cause more than 100 deaths in Canada every year.<sup>16</sup> Similarly heat waves can have a substantial impact on human health by exasperating the risk of heart attack or worsen medical conditions such as diabetes. Extreme heat can result in other ailments related to excessive heat exposure - dehydration, heatstroke, heat cramps, and heat exhaustion – in healthy populations. During a 5-day heat wave in Chicago in 1995, the number of deaths increased by 85%. The very young and elderly are the most vulnerable to heat waves because they have a more limited capacity to regulate their body temperatures through prolonged extreme heat. At greater risk are those who lack access to air conditioners, pools or cool recreational facilities needed for relief from excessive heat. Heat waves are expected to increase with climate change.<sup>17</sup>

The City of Hamilton Public Health Services issues extreme cold or smog alerts and works with community agencies to develop actions to protect the vulnerable from extreme weather conditions. The actions for extreme cold alerts include transporting and sheltering of people who are at particular risk. safety strategies can include general health related information and developing an inventory of residential premises whose occupants may be at high risk in the event of extreme heat, so that relevant responses can be developed that are tailored to the population at risk. It has been suggested that heat safety programs be strengthened through coordination with public air quality advisories.<sup>18</sup> Public Health is piloting an approach to combine heat safety messages with public smog advisories in Hamilton.

To adapt to the potential impacts of extreme weather, further public health programs will need to be established to reduce the health impacts and risks to the public associated with climate change.

---

<sup>16</sup> Institute for Catastrophic Loss Reduction: *Climate Change, Natural Hazards and Cities*, 2003.

<sup>17</sup> McGeehin, and Mirabelli, *The Potential of Climate Impacts of Climate Variability and Change on Temperature-Related Morbidity and Mortality in the United States*. Vol. 109, Supp 2, Environ. Health Perspect. May 2001.

<sup>18</sup> Pollution Probe, *Towards an Adaptation Action Plan: Climate Change and Health in the Toronto-Niagara Region*, 2002

## Disease Vectors

Studies have suggested that global warming and extreme weather affects the breeding and range of disease vectors such as mosquitoes and rodents responsible for malaria, yellow fever, hantavirus, Lyme disease, Rocky Mountain spotted fever, dengue fever, encephalitis, and West Nile virus.

Lyme disease, the most widespread vector-borne disease, is currently increasing in North America as winters warm and ticks proliferate. Ragweed pollen growth, stimulated by increasing levels of carbon dioxide, may be contributing to the rising incidence of asthma.<sup>19</sup> In combination with poor air quality, climate change can aggravate and combine health impacts. For example, allergists are now beginning to see the combined impacts of smog and pollen referring to the double mixture as “smollen”.<sup>20</sup>

West Nile Virus is a virus found in wild birds and carried by mosquitoes. When an infected mosquito bites a bird, the bird can become infected and can pass the virus on to other mosquitoes. When an infected mosquito bites a human, the virus can cause mild-to-severe symptoms, including West Nile fever or encephalitis.

The City adopted a West Nile Virus Plan in 2004, and the City’s Public Health Services runs the West Nile Virus program. Actions include educating the public on West Nile Virus, tracking dead bird reports within City limits and enforcement of the standing water by-law.

To adapt to the potential increase in disease vectors, further public health programs may need to be established to reduce the health impacts.

## Water Quality & Supply

Lowered lake and river levels predicted by many climate models could have negative impacts on shipping, water intake infrastructure, rural groundwater supply, hydropower generation and shoreline property and lead to degraded water quality as well as ecosystem disruption.

Increased moisture deficits and frequent localized droughts may lead farmers and other individuals dependent on water resources to consider supplementary irrigation and new water sourcing leading to competition over allocations.

Hamilton’s storm water management programs are pivotal to preserving water supplies and improving source water quality. Increased precipitation will challenge the design capacity of water collection systems, and multiply the probability of flooding. Excess runoff from overwhelmed sewer systems could permit the release of contaminants into local water sources. In 2002, heavy rainfall in Walkerton washed harmful bacteria from manure into a municipal well, causing seven deaths and serious illness to others.<sup>21</sup>

<sup>19</sup> Centre for Health and the Global Environment, Harvard Medical School, *Climate Change Futures: Health, Ecological and Economic Dimensions*, 2005

<sup>20</sup> CBC News: *Smog, Pollen Mix Worsens Allergy Symptoms*, May 2006.

<sup>21</sup> O’Connor, The Hon. Dennis R. *Report of the Walkerton Inquiry – Part One: A Summary*, 2002.

The City is undertaking a Stormwater Master Plan to provide strategies for servicing and management guidance for the City's stormwater system (including storm trunk sewers) for the next 30 years, and a strategy to protect, enhance and restore the environmental resources within Hamilton's 15 watersheds as land use changes occur. A study of the historical analysis of meteorologic records will be undertaken in order to define the impact on infrastructure (capacity and susceptibility to flooding) and the environment (water quality, fisheries, erosion, baseflows etc.). The City also has formed SERG (Storm event response group) committee which is exploring the causes of stormwater infrastructure failure, infrastructure response to changes in rainfall patterns and will make recommendations for solutions.

The City is also undertaking a City-wide Water and Wastewater Master Plan to develop policies and strategies for its water and wastewater servicing over the next 30 years. This includes the lake based water distribution system and sanitary sewer systems. One of the policies behind the Plan is for the City to maintain sufficient reserve capacity in its water and wastewater infrastructure and facilities to provide operational flexibility and meet potential changes in servicing conditions (such as power failures, growth rates and fluctuating demands).<sup>22</sup>

Since 2002, the City's Public Works Department has undertaken a Water Metering Program to reduce municipal water use by households & businesses. The City has also initiated a Groundwater Resources and Wellhead Protection Partnership Study as an initiative to help protect groundwater resources within the City. The objectives of the study are to ensure a continued safe drinking water supply to Hamilton residents who depend on municipal groundwater supply wells, specifically those in the communities of Freelon, Carlisle, Lynden, and Greensville where the City operates local water systems.

The Wastewater Investment Needs and Strategies (WINS) is dedicated to long-range planning and implementation of appropriate wastewater infrastructure upgrades. The City initiated the WINS program to address the technical, social and financial needs of wastewater infrastructure over a 30 year period. The challenges for this program include Hamilton's aging infrastructure, anticipated growth, and most importantly water quality targets established by the Hamilton Harbour Remedial Action Plan (RAP) and by the Ministry of Environment.

## Built Environment

Building designers, operators and managers need to consider climate change in building and construction. Buildings and their construction account for 25% of Canada's overall greenhouse gases emitted through the processing of new construction, combustion of fossil fuels to meet water and space-heating requirements and electrical consumption in lighting and air conditioning.

The other aspect is for the building to adapt to a changing climate. In other words, the impacts of land use patterns and building/construction on air quality and climate change, and the impact of air pollutants and climate change on buildings. Climate change will have major effects on the development of future building standards and environmental regulations.

---

<sup>22</sup> City of Hamilton Public Works, Infrastructure & Environment Committee, *City of Hamilton Water and Wastewater Master Plan Policy Paper (PW05050)*, April 2005.

Vulnerability is further augmented by Canada's aging and deteriorating infrastructure; in many cases, the minimum standards that were used to design capacity in urban infrastructures are no longer appropriate for a changing climate. A 1995 survey by the Federation of Canadian Municipalities and McGill University indicated that Canadian urban infrastructure is dangerously outdated and requires upgrades that could cost up to \$44 billion.<sup>23</sup>

Climate change may lead to potential increases in the amounts of precipitation as well as the frequency of extreme weather events, including storms. Thus it is also likely that there will be an increased rate of weathering on the built environment. Damage to buildings from weather can be caused by: storm damage; rain penetration; poor durability of construction materials; flood damage; coastal erosion and foundation movement.

To respond to these anticipated changes, new buildings should compensate for changing weather in their design, materials and construction processes. For example, using new technologies like green buildings and encouraging LEED Certification (Leadership in Energy and Environmental Design) which indicates the level of sustainable design concepts incorporated into the site and building design. Old buildings may be adapted or retrofitted to be able to withstand harsh weather effects.<sup>24</sup> City Council has directed an investigation of LEED certification for new City facilities<sup>25</sup>.

Heat Island Reduction (HIR) strategies (i.e. shade trees, reflective roofs, less reflective pavements and urban reforestation) can reduce cooling energy use in buildings, lower the ambient air temperature and improve local air quality

Building service retrofits such as solar panel and roof garden installations increase energy efficiency, improve thermal comfort, and saves peak demand electricity which generates savings on heating and electricity bills. They also contribute to reduced stormwater runoff and improved air and water quality. Similarly strategically placed trees, shading windows and walls of a building, reduce the amount of direct heat gain. Trees act as filters, trapping dust particles and absorbing gaseous pollutants.

The City has been participating in the coordination and preparation of the National Guide to Sustainable Infrastructure known as InfraGuide with the Federation of Canadian Municipalities and the National Research Council. The Guide provides a road map to the best available solutions for addressing municipal infrastructure issues and is meant to be a focal point for a Canada-wide network of practitioners, researchers and municipal governments focused on infrastructure operations and maintenance. The City of Hamilton was the 2005 recipient of the InfraGuide National Award of Excellence that recognizes leadership and innovation in municipal infrastructure management that embrace InfraGuide's Principles and Guidelines for Sustainability.

---

<sup>23</sup> Institute for Catastrophic Loss Reduction, *Climate Change, Natural Hazards and Cities*, 2003.

<sup>24</sup> Canadian Climate Change Impacts & Adaptation Research Network (accessed online at <http://www.c-ciarn.ca/>)

<sup>25</sup> City of Hamilton Committee of the Whole, *Committee of the Whole Report 06-007*, May 2006.

## Hazard Land Management

Changes in climate plays a key role in triggering landslides through extreme rainfalls, disruption of freeze-thaw cycles and faster melting of snowfall resulting in less stable slopes and areas. Hamilton experienced unusually high volumes of rainfall over a short period of time in July and August 2005. The force of water on August 2005, drove 1088 tonnes of shale and debris down the escarpment at the Chedoke golf course.

Changes in precipitation patterns and extreme weather events also lead to an increase in flood frequency. Increased frequency and magnitude of flooding will increase the hazard to structures, buildings and humans. The effects of climate change may amplify the existing impact of human activity on rivers. The most significant mitigation for this is to be able to accurately forecast flood situations.

In Ontario, Conservation Authorities were established to manage issues related to the flood plain. Flood forecasting is the responsibility of the local Conservation Authority in partnership with the Ministry of Natural Resources. Municipal governments and other agencies act to minimize the impacts of flooding on communities through land use planning, building design and construction.

## Tree Planting & Preservation

Since 1998, the Hamilton Tree Planting Program has enabled Hamilton citizens to plant a total of over 2100 native species trees to improve local air quality. The City, in partnership with Clean Air Hamilton and Green Venture, offered homeowners subsidies for native trees to be planted on their properties. Encouraging tree planting within a community serves many purposes: trees act as carbon sinks that can off-set the release of greenhouse gases by other sources; they provide shade that can mitigate the “urban heat island effect”; they offer shade that can protect people from the damaging effects of the sun’s ultra-violet light; they can provide cool retreats for people during heat waves; and they may remove many pollutants from the atmosphere

The Forestry Management Plan for City Owned Trees guides the delivery of forestry services to obtain maximum community benefit. In 2002, there were an estimated 300,000 street trees in urban areas and 120,000 park and open space trees on City property. The urban forest includes public owned trees located on residential boulevards, parks, natural areas, institutional/City owned sites, waterfronts and trees from other public use areas. The Plan ensures there is a minimum level of service for all municipally owned trees, and the total number of trees in the City increases with plantings.

The Trees Across Hamilton program was initiated in an effort to undertake community based naturalized tree plantings in each Ward across the City. The 2005 pilot program was carried out over six weekends with volunteers, Ward Councillors, and staff participating in the tree planting events. In total, 3,000 tree whips and 2,000 seedlings were planted in thirteen different locations.

## Climate Change - Departmental Roles & Responsibilities:

The Public Works Department is the corporate lead on adaptation to climate change. The Public Works Department is responsible for city infrastructure, greenspaces and water quality and supplies. City operations and services that would need to adapt to a changing climate and prepare for the impact of air quality and climate change such as extreme weather. The Public Works Department already undertakes a number of activities to reduce or mitigate air pollutants and greenhouse gases from city operations and services (see Action Category IV). Addressing adaptation, as the corporate lead, would expand some of the activities already undertaken by the Department and link them to the reduction activities they currently undertake.

Public Health would continue to be responsible for engagement and education on disease vectors and cold alerts as these are threats to the public health of citizens and the programs are currently developed. Public Health could increase public health programs to address climate change and air quality.

Emergency Response and Planning remains the responsibility of Emergency Services. The City's Emergency Management Program may present an opportunity to address the risks of weather related events resulting from climate change and should be explored.

The responsibility of land use and built environment resides both within the Planning and Economic Development and the Public Works Departments. A working relationship between both Departments has been established in the area of land use and transportation planning, of which infrastructure is a component. Since this relationship linkage of policy with the implementation of services and city operations is established, the co-operative relationship should continue in respecting each Departments mandate and function under the Corporate Air Quality and Climate Change Strategic Plan.

	Lead Department	Roles & Responsibilities	
<b>III</b> <b>Adaptation to Smog &amp; Climate Change</b>	<b>Public Works (Climate Change Adaptation)</b>		<ul style="list-style-type: none"> <li>▪ Extreme Weather Events</li> <li>▪ Water Quality &amp; Supply</li> <li>▪ Built Environment</li> <li>▪ Tree Planting &amp; Preservation</li> </ul>
		<b>Supporting Departments</b>	
		<b>Public Health</b>	<ul style="list-style-type: none"> <li>▪ Cold/heat alerts, disease vectors</li> </ul>
		<b>Emergency Services</b>	<ul style="list-style-type: none"> <li>▪ Emergency Response</li> </ul>

## IV Reducing Emissions, Key Pollutants & Greenhouse Gases

Reduction, or mitigation, is directed at reducing atmospheric concentrations of air pollutants and greenhouse gases resulting from municipal operations and services (i.e. areas of direct control or influence by the Corporation).

### Reduction strategies should:

- Define actions to reduce greenhouse gas emissions and improve air quality in corporate operations, and
- Encourage actions by staff, citizens and industries to reduce their personal emissions to improve air quality and retard climate change.

Public Works is the main City Department responsible for the operations of most facilities of the municipality. **Key operations include:**

- transportation management
- buildings and infrastructure management
- energy management and conservation; and
- waste management and reduction.

These operational areas are or can be directed by policies and actions to reduce or mitigate air pollutants and climate change.

The Planning and Economic Development Department has a role to play in the reduction of air pollutants and greenhouse gases through the structure and design of the built urban environment. Land use planning to encourage a more compact mixed use of land that protects greenspaces, and mitigates the impacts of climate change is essential to achieve emission reductions over the long term.

## Fleet Greening

Municipal fleets can be responsible for a significant portion of corporate air pollutants and greenhouse gases emitted in the course of municipal operations.

In 2004, the Corporation directed the implementation of a Central Fleet Strategic Plan. This Plan included a Green Fleet Transition Plan to provide an affordable way to use new vehicle and fuel technology. The Green Fleet Implementation Plan (2005) was developed for the Central Fleet, which manages vehicles used by the Public Works Department, the Planning and Development Department, and several other City agencies (the Corporate Fleet) to implement affordable and sustainable vehicle technology. Actions within the Plan include:

- Light duty vehicles replaced with hybrid gas-electric vehicles where practical, as they become due for replacement;
- The City's bulk fuel supply include 10% biodiesel content; and,
- An Anti-idling policy for City vehicles.

**The Corporation's fleet of hybrid light-duty vehicles is one of the largest in Canada with 40 hybrid vehicles now in service to demonstrate that a market exists for more fuel-efficient vehicles and is committed to their production by placing firm orders for fuel-efficient hybrid vehicles.**

The City also participates in and promotes The Repair Our Air Fleet Challenge. A program funded by Natural Resources Canada with the purpose of reducing greenhouse gas emissions through the promotion of efficient fuel management practices and the reduction of vehicle idling.

The City is currently engaged in a project initiated by the federal government to develop heavy-duty vehicles with hybrid diesel-electric or hybrid diesel-hydraulic launch systems. It is expected that this project will produce hybrid versions of a garbage packer and a tree service aerial truck as well as a courier truck.

## Transportation Demand Management

The City of Hamilton in cooperation with a number of other municipalities in the Greater Toronto Area is proposing to establish a Greater Toronto Demand Management Program called Smart Commute. The project examines establishing a network of transportation management associations throughout Hamilton and the Greater Toronto Area. These associations will focus on reducing auto demand, particularly for peak-periods work trips, through initiatives such as a ride matching service, education/training, establishing a van pool program and car sharing program.

The Commuter Challenge is a week-long, friendly competition where Canadian cities compete to reduce air pollution by using active and sustainable modes of transportation. Hamilton has undertaken the Commuter Challenge for six years. The City of Hamilton's Commuter Challenge began in the year 2000 when 41 companies and over 700 individuals made the commitment to eco-commute. In 2005, 28 organizations registered for the challenge and participation included 1,915 Hamiltonians.

The City also offers eligible employees a discounted bus pass. The Employee Commuter Pass program is available to full time employees who do not have an employer paid parking and is available through a flexible payroll deduction. The program is consistent with the objectives of the Downtown Transportation Plan and encourages the use of transit.

## Energy Management

The City of Hamilton has assumed responsibility for the usage of energy from the energy grid. An energy management program has been in place since 2004 to help reduce the amount of energy all City buildings require to operate. The focus is on providing energy efficient solutions that upgrade facilities while reducing operating costs, improving indoor air quality, addressing code compliance and reducing environmental emissions. This program reduces energy consumption, which in turn reduces the amount of greenhouse emissions the City is responsible for producing. The goal is to reduce all City facilities' energy consumption by 10-15%. The City has engaged in an energy management feasibility study of 22 City operated facilities (Arenas, Recreation Centres, Libraries, Fire stations, Public Works Operation

centers Social Housing, and Municipal centres). The City is now undertaking the implementation phase of an energy retrofitting project.<sup>26</sup>

The City has Corporate Computer Equipment Shutdown guidelines for the daily routine for shutting down corporate computer systems and related devices such as printers. The guidelines ensure best practices will result in reduction of energy consumption for the Corporation, reduce wear and time loss on corporate computer systems.

The City has begun to explore the future impacts of energy availability on Hamilton through the examination of the Peak Oil concept.

**Peak Oil describes the situation where future world oil production reaches a peak and then rapidly declines resulting in higher energy costs.**

The City understands that a strategy for responding to peak oil must recognize two policy response areas: the Corporation strives to minimize its own costs. Secondly the City seeks to sustain the economic, social, and environmental welfare of Hamilton's residents and businesses in the event of serious energy supply constraints.

In 2006, the City created an Office of Energy Initiatives position within the Public Works Department to formalize and centralize responsibility for energy management in the City by focusing on how and where the City of Hamilton is spending money on energy and to look for ways to save and reduce energy consumption.

The Office of Energy Initiatives may, amongst other functions:

- Develop and implement billing verification strategies;
- Develop purchasing strategies and practices for commodities (natural gas, electricity and eventually fuel (diesel, unleaded, and biodiesel));
- Establish consumption reduction targets and guidelines for the use of renewable energy sources in City Projects (subject to Council approval);
- Develop and project manage energy retrofit projects (i.e. recent approval for retrofit of 22 City buildings); and
- Raise awareness in the Corporation with respect to energy use.

## Land Use & Transportation Planning

Canadian cities have been characterized by urban sprawl associated with low density land use and increasing greenspace reserves within developing suburban areas, and segregated land use patterns that separate home, work, shopping and recreational facilities. Urban sprawl leads to increased motorized travel distances than would be unnecessary in more compact, mixed use land developments.

Low-density development patterns promote the use of the personal vehicle for more functions due to greater distances and difficulty in combining trip purposes. This can discourage more healthy forms of transportation such as walking and bicycling. In most situations, public transit requires high-density and

---

<sup>26</sup> City of Hamilton Public Works, Infrastructure & Environment Committee, *Energy Retrofit Pilot Program: Implementation Phase (PW06078/FCS06067)*, June 2006.

more compact land use to be cost-effective. A decrease in public transit ridership and the decrease in use of active forms of transportation increase the demand for road travel and its associated infrastructure. This demand for automobile usage leads to increased traffic congestion, thereby increasing travel time, minimizing fuel efficiency and increasing vehicular emissions of air pollutants and greenhouse gases.

### **Ontario Provincial Policy Statement (2005):**

The Ontario Provincial Policy Statement provides policy direction on matters of provincial interest related to land use planning and development. Air quality & climate change effects of planning decisions are two of the many factors that need to be evaluated in the decision-making planning process. Section 1.1.3.2 (a) (3) of the Statement makes specific mention of the importance of minimizing impacts to air quality, climate change and promoting energy efficiency.

The City of Hamilton is actively engaged in planning to create a more compact urban form, direct new development and density to support transit, and reduce auto emissions through the 30-year Growth-Related Integrated Development Strategy (GRIDS), Transportation Master Plan, Green Fleet Implementation Plan and Energy Management Program

Commencing in 2003, the City developed the Growth Related Integrated Development Strategy (GRIDS) to identify and assess options for a broad land use structure, and associated infrastructure, enhance the economic development strategy and assess fiscal implications for the growth of the City. GRIDS is focussed on the urban areas of Hamilton. A parallel process for the rural areas is being undertaken as part of the Official Plan review. The objective of GRIDS has been to achieve a balance amongst social, economic and environmental considerations. One of the key inputs into GRIDS is the Transportation Master Plan which has undertaken policy research into the greenhouse gas emissions resulting from transportation options.

The GRIDS process aims to meet a higher, yet realistic level of intensification, focus urban growth around transit infrastructure, provide improved support to future transit initiatives, develop new areas as compact communities, and protects local natural features and greenspace. It addressed the Provincial growth management and planning initiatives of the Places to Grow plan, the Greenbelt Plan, and the Provincial Policy Statement.

The preferred growth option for Hamilton has been identified as a “Nodes and Corridors” approach. Corridors are mixed uses areas that serve a main street function that do/will provide locations for the retailing of goods and services, community and recreational uses. The nodes reflect existing areas of live, work and play activities and residential intensification opportunities will be directed/facilitated to occur within the defined nodes to support public transit and the objectives of the growth management strategy. During the GRIDS process, conceptual neighbourhood plans were developed to demonstrate how more compact, mixed use communities could be developed based on citizen’s suggestions of development that encourages a greater mix of uses and social diversity while providing for transit and “walkable” (i.e. pedestrian and bike linkages) communities.<sup>27</sup>

---

<sup>27</sup> City of Hamilton Committee of the Whole, *Growth Related Integrated Development Strategy – Final Report (CM06015)*, April 2006.

GRIDS will serve as the point of departure for a number of plans. The overall growth management strategy will be implemented through a wide range of mechanisms including, but not limited to, the Official Plan, Water and Wastewater Master Plan, Stormwater Master Plan, Transportation Master Plan, Development Charges By-law and other financial programs, Social Development Strategy, and the Economic Development Strategy.

The City has undertaken an Environmental Remediation and Site Enhancement (ERASE) Community Improvement Plan which contains a comprehensive set of programs to promote the rehabilitation and redevelopment of brownfield properties within the 3,400 acres of old industrial area. “Brownfields” are generally abandoned, idled or underused industrial or commercial properties in built-up urban areas where expansion or redevelopment is complicated by real or perceived environmental contamination, building deterioration/obsolescence, and/or inadequate infrastructure. The objective of ERASE is to bring these properties back into economic use while reducing the environmental impacts of the property. Brownfield development can reduce the amount of greenfield land being consumed, thereby reducing urban sprawl and its associated negative environmental impacts including air and water pollution and the loss of agricultural land.

The Downtown Transportation Master Plan and Secondary Plan, represent an integrated land use and transportation planning exercise which views the future Downtown Hamilton as an overall system as opposed to separate components.

The Transportation Plan aims to support a mix of land uses and built form, and ensure development can be supported by the transportation system and parking controls; supports short-term business oriented parking, discourages long-term parking and provide public parking in strategically located structures or lot. In the long term, its objectives is to reduce the number of off-street parking lots and replace them with buildings, parkettes and landscaping; divert through-traffic around the downtown core and implement traffic-calming measures where appropriate, and give priority to pedestrian safety over vehicles that will create an attractive pedestrian environment with improved air quality.

Urban greenspaces can provide a range of benefits including mitigating air and water pollution, providing opportunities for recreation, fostering cohesive neighborhoods, attracting businesses, and stabilizing property values. Investing in open space can serve as an anchor for revitalizing neighborhoods and building healthy communities.

Linking to the Downtown Transportation Master Plan and the Downtown Secondary Plan is the Streetscape Master Plan which seeks to enhance the quality of existing downtown corridors through extensive street tree planting, new trail connections and for enhancements to existing open spaces, parks, schools, and cultural landscapes. The Plan aims to “create a green construct of connected open spaces as a renewed setting in urban environments and continued economic growth and reinvestment in the core city”

Developing recreational opportunities and trails that support alternative transportation such as bicycles and walking encourage individuals to reduce their auto dependency and adopt a healthier lifestyle while reducing transportation sources of air pollutants and greenhouse gases.

**Pedestrians and cyclists account for a high proportion of the trips generated within downtown Hamilton. Multi-use trails provide viable and valuable alternatives to automobile usage throughout the City.**

The Hamilton Trails Master Plan seeks to prescribe a comprehensive multi-purpose off-road recreational trail system to connect natural areas, cultural features, major land use destinations and link with on-road commuter corridors within the City of Hamilton. Through the Plan, transportation options and recreational activities are encouraged while linkages amongst greenspaces are increased within Hamilton.

## City Operations

### Street sweeping

Fugitive dust emissions are often referred to as road dust, and can be detected visually when traffic or wind disturbs dust, soil or silt on the ground, causing it to become airborne. The fugitive dust emissions disperse into the air and impacts downwind air quality.

The composition of road dust varies depending upon adjacent land uses, local emission sources and traffic loads. It can consist of inhalable particulate matter (PM<sub>10</sub> & PM<sub>2.5</sub>) from vehicle exhaust, tire wear and pavement wear, and it can consist of material tracked off industrial sites, blown off construction sites, and/or settled from low level emission sources such as scrap-yards.

In Hamilton, local road dust impacts occur routinely in industrial areas during business hours when truck traffic is the heaviest. The combination of truck track-out of soil and dust onto roads and heavy traffic causes large quantities of dust to be stirred up.

Fugitive dust control is an important responsibility of industrial, bulk storage and aggregate industry. On-site management of soil and dust at the site level has a direct influence on the availability of both for dispersion into the air and tracking onto the roadways. Dust control on properties can prevent dust and soil from becoming airborne, from being tracked-out, or from being created or transported in the first place and unpaved properties creates a “dust bowl” effect, increasing impacts of road dust. The City is engaged with partners and the Ministry of the Environment on a fugitive dust abatement strategy.

Street sweeping of roadways can reduce or increase the impacts of dust along roadways. The effectiveness of equipment, the technology used, and the frequency of sweeping have a direct influence on the availability of soil and dust available for dispersion into the air from traffic.

The City has purchased regenerative street sweepers to replace aging vehicles in the fleet. The regenerative air technology is more effective at controlling fine particulate matter than either mechanical or vacuum-assisted machines. In 2005, in partnership with the City of Toronto, street sweeping vehicles were subject to performance testing in the ability to reduce air pollutants (particulate matter) in their street sweeping operations prior to purchasing. The City has purchased six, with two more to come, regenerative air street sweepers that passed the performance testing in reducing particulate matter and keeping operations costs down.

## Purchasing

Municipalities can spend millions of dollars each year in the purchasing goods and services. Some of the most immediate and significant ways in which municipalities can improve air quality and retard climate change is through their purchasing decisions.

Examples of actions include:

- Giving preference to energy efficient products with an **ENERGY STAR**<sup>®</sup> label
- Giving preference to products that are re-useable, durable and contain recycled content
- Looking for products and services with Environment Canada's **EcoLogo**<sup>™</sup>
- Giving preference to products that reduce or eliminate air pollutants. For example, purchasing products made of recycled material, cleaner fuels and vehicles in municipal fleets.

Through the Green Fleet Implementation Plan (2005), the City has begun to purchase alternative technology and fuels for the use in fleet vehicles such as low emission and hybrid vehicles and renewable fuels.

The responsibility of developing green aspects into the specifications of the products or service to be procured is undertaken by the respective Department requesting the goods or services to be delivered. Under a Corporate Green Procurement Policy, the incorporation of green aspects into the products and service procured would be assured, with associated cost savings, and could reduce the air quality, climate change and other environmental impacts (energy, resources, waste, etc.) that may result from the making or use of products and services. The City's Corporate Services Department that assists Departments in purchasing of goods and services, working with respective Departments, could examine the benefits and practicality of a corporate green procurement policy for the Corporation.

## Waste Management and Reduction

Landfilling is the most common waste disposal method and, in many cases, the one that produces the most greenhouse gas emissions when there is no landfill gas capture system in place. The anaerobic decomposition of waste in landfills produces methane, a greenhouse gas 21 times more potent than carbon dioxide.<sup>28</sup>

Incineration, a less common disposal method, results in emissions of both carbon dioxide and nitrous oxide. Combusted waste can displace the burning of fossil fuels by producing electricity or heat for nearby buildings or industry.

In addition, the transportation of waste to disposal sites produces greenhouse gases from the combustion of the fuel used in the equipment. Finally, the disposal of materials indicates that new products are being produced as replacements. This production often requires greater use of fossil fuels to obtain raw materials and manufacture the items.

---

<sup>28</sup> United States Environmental Protection Agency (2006) *Global Warming*

Recycling can have a large impact on reducing greenhouse gases, because it replaces some of the raw materials and energy used in the manufacturing process. Using recycled material not only reduces emissions used to produce these products, but also the energy required for manufacturing. For materials that require intensive processing, such as steel, plastic and aluminium, recycling can reduce emissions by about two tonnes of carbon dioxide equivalent per tonne of product. Paper recycling also increases carbon storage because it leaves more trees growing in the forest.

Composting is an option available only for food scraps and yard waste. Because it involves aerobic decomposition, composting does not generate methane emissions, and only releases a small amount of carbon dioxide.

Hamilton's long term plan, the Solid Waste Management Master Plan (SWMMP), was approved by City Council in December 2001 and the target of 65% diversion from landfill was set at that time. Amongst the recommendations of the Plan are the adoption of a three-stream waste collection system (recyclables, organics and residuals), and centralized waste composting facility and community recycling and reuse centres. An Energy from Waste (EFW) facility was identified in the recommendations as potentially forming part of the City of Hamilton's waste management system.

The approved Plan became more critical with the closing of Hamilton's Solid Waste Reduction Unit (SWARU). The closing of SWARU incinerator in 2002 benefited local air quality with regards to air toxics, but was also identified as increasing the greenhouse gas emissions associated with City Operations.<sup>29</sup> However, the closing of SWARU also redirected waste to the Glanbrook landfill and reducing the life span of the landfill.

The City has undertaken a number of waste management initiatives that support the SWMMP and divert and reduce the amount of waste to landfills, thereby reducing the amount of greenhouse gases generated from waste. These programs include the organic waste Green Cart program, the Blue Box recycling program, the creation of community recycling centres and household special waste. Hamilton has also built a central composting facility, located on former industrial land, which will process the organic materials diverted through the City's Green Cart program.

The Niagara-Hamilton WastePlan is a joint initiative of the Regional Municipality of Niagara and City of Hamilton to work together to find a way to manage solid waste remaining after 65% diversion from the two communities.

The process recognizes that diversion programs help reduce the amounts of waste going into each community's landfills in the short term, but for the long term, the option of disposal may greatly reduce the amount of waste that is sent to landfill and needs to be considered (e.g. thermal technologies, mechanical and biological processes, etc.).

The WastePlan is being carried out under the Provincial Environmental Assessment Process and is a multi-year study that involves extensive community consultation. Each preferred option undergoes an extensive assessment of impacts to the economy, community and the environment in categories such as air quality and climate change.

As part of the Hamilton-Niagara WastePlan, it is proposed that solid waste be managed primarily through waste diversion, but thermal processing will be used to manage the majority of the post-diversion residual waste and to recover energy from the combustible portion of the residual waste stream.

---

<sup>29</sup> City of Hamilton, Vision 2020 (2004) *Annual Sustainability Indicators Report 2004*

## Idling Control

Idling any vehicle pollutes the air, contributes to climate change, wastes natural resources for little benefit to the vehicle operator, harms passengers (by polluting the air inside the vehicle) and wastes money. Anti-idling aims to reduce air pollution and climate change by controlling emissions of carbon dioxide & nitrogen oxides.

Unnecessary idling results in Canadians wasting over 3.2 million litres of fuel a day. This costs about \$1.9 million and produces over 7.6 million kilograms of greenhouse gases, based on 10 minutes of idling per day. A freight-hauling truck averages 6 hours of idling a day for 43 weeks of the year. This means that a single truck emits about 21, 000 pounds of carbon dioxide, 390 pounds of carbon monoxide and 225 pounds of nitrogen oxides per year.

The City of Hamilton does not have a City-wide anti-idling by-law. However, the Corporation has implemented a policy with regards to internal fleets as a component of the Green Fleet Implementation Plan. Signs have been placed in areas of Hamilton to remind drivers to turn their engines off if they are waiting for a long period of time.

The City through partnership with Clean Air Hamilton and Green Venture is developing an idling awareness campaign for the community. The campaign will aim to encourage behavioural change among those who live and work in Hamilton through education and awareness.

## Departmental Roles & Responsibilities:

The City’s Public Works Department will be the corporate lead on reducing emissions, key pollutants and greenhouse gases by the corporation. Municipal operations and services (i.e. areas of direct control or influence by the Corporation) falls under the mandate of the Public Works Department, and the Department has already undertaken a number of initiatives to reduce emissions in their services.

In the area of land-use and transportation planning, the Departments of Planning and Economic Development and Public Works have established a working relationship that integrates land use and transportation policy with the implementation of services and city operations. This relationship will continue with both Departments taking responsibility for individual activities that falls under the respective mandate and function of the Department under the Corporate Air Quality and Climate Change Strategic Plan.

	Lead Department	Roles & Responsibilities	
<p style="text-align: center;"><b>IV</b></p> <p style="text-align: center;"><b>Reducing Emissions, Key Pollutants &amp; Green House Gases</b></p>	<b>Public Works</b>	<ul style="list-style-type: none"> <li>▪ Fleet Greening</li> <li>▪ Transportation Demand Management</li> <li>▪ Energy Management</li> <li>▪ Land Use &amp; Transportation Planning</li> <li>▪ City Operations</li> <li>▪ Waste Management &amp; Reduction</li> <li>▪ Idling Control</li> </ul>	
		<b>Supporting Departments</b>	
		<b>Planning &amp; Economic Development</b>	<ul style="list-style-type: none"> <li>▪ Land Use &amp; Transportation Planning               <ul style="list-style-type: none"> <li>○ Compact Urban Form</li> <li>○ Preservation of Green Space</li> <li>○ Urban Design</li> </ul> </li> </ul>
		<b>Corporate Services</b>	<ul style="list-style-type: none"> <li>▪ Purchasing &amp; Procurement</li> </ul>

## V Program Delivery

### Implementation

The City delivers a variety of policies and programs that address air quality and the reduction of greenhouse gases. However, a strategy to bring the current policies and programs together and translate into a corporate effort to address both air quality and climate change in the form of a strategic plan is required.

#### Identify Responsibility

This report of the long-term Plan identifies roles and responsibilities of City Departments by recognizing corporate leads and supporting Departments in an air quality and climate change network, respecting those Departments mandate and functions. The Corporate Air Quality and Climate Change Strategic Plan encourages Department to undertake further actions and expand programs to address air quality and climate change in the delivery of their services and operations in the City of Hamilton.

#### Ensure Regulatory Compliance

The Corporate Air Quality and Climate Change Strategic Plan, and actions within, seek to ensure that corporate operations are in compliance with external regulations and that corporate air quality and climate change activities are monitored and evaluated, based on current available information.

As outlined under Action Category II of the Plan, individual Departments are responsible for ensuring their service and operations are compliant with relevant legislation. A proposed Inter-Departmental Air Quality and Climate Change Working Group, with the assistance of the Air Quality Co-ordinator, will ensure that emerging legislation and policies with respect to overall air quality and climate change decisions is distributed within the Corporation.

#### Create an Internal Collaboration & Reporting Structure

Phase II will outline specific implementation details and actions of the long-term Plan. However, to implement a Corporate Air Quality and Climate Change Strategic Plan for the City of Hamilton, new or redirected resources and collaboration amongst Departments and divisions is needed. Collaboration and partnerships within the City has been demonstrated in the development of the City's Vision 2020 Strategy, GRIDS, Transportation Master Plan, and the Corporation's Triple Bottom Line Reporting.

However the formation of an Inter-Departmental Air Quality and Climate Change Working Group and Climate Change Advisory Committee could formalize the partnerships within the Corporation and aid in the establishment of roles.

## **Inter-Departmental Air Quality and Climate Change Working Group**

An Inter-Departmental Air Quality and Climate Change Work Group would co-ordinate and have responsibility for the actions of the corporation to address air quality and climate change and serve as a clearing house to disseminate information on corporate actions and priorities regarding air quality and climate change.

Representatives of the group would be from the Departments within the Corporation who can engage and promote actions to reduce air pollutants and greenhouse gases and adapt to climate change within City operations, policies and programs. Representation on the group would be from the identified Corporate Lead Departments of the Plan's action categories (Planning & Economic Development, Public Works, Public Health).

The working group could undertake an inventory of current efforts including reductions of air pollutants and greenhouse gases, identify programs and areas where gaps exist in the strategic plan, and working with the Climate Change Advisory Committee recommend actions to be taken corporately to address air quality and climate change.

The Inter-Departmental Air Quality and Climate Change Working Group would report to the Climate Change Advisory Committee on measures and progress to reduce and adapt to climate change and consult with Clean Air Hamilton on projects pertaining to air quality improvements.

## **Clean Air Hamilton**

Clean Air Hamilton would continue to advise the City on matters of air quality and work with government partners, community stakeholders and the private sector in developing strategies to improve air quality in Hamilton. Clean Air Hamilton would continue its research on air quality and encourage behavioural changes in individuals living and working in Hamilton.

The Inter-Departmental Air Quality and Climate Change Working group would consult with Clean Air Hamilton on projects pertaining to air quality improvements.

## **Climate Change Advisory Committee**

The Climate Change Advisory Committee would advise the City on matters of climate change and work with government partners, community stakeholders and the private sector in developing strategies to address climate change in Hamilton.

Representatives of the group would be from the City, industry, community/citizens, government, academic, health professionals and similar partners who can engage and promote actions to reduce greenhouse gases and adapt to climate change within the City of Hamilton. This group would have links to the community on climate change actions for the City, and build partnerships to undertake joint programs/actions on air quality and climate change. The Climate Change Advisory Committee would consult and work with Clean Air Hamilton on projects relating to air quality improvements.

The Climate Change Advisory Committee would report to Council annually on the progress of reducing greenhouse gases in the City.

## Identify Alternative Service Delivery Opportunities

Alternative service delivery can be defined as an organizational option or response to the challenge of improving the capacity of governments to manage change, promote innovation and meet their infrastructure and service-delivery obligations more efficiently and effectively. Collaborative partnerships are an approach that municipalities can undertake as alternative service delivery.

Individual City Departments may need to explore alternative service delivery models for services and operations where resources to undertake action on improving air quality and reducing greenhouse gases are lacking.

## Monitoring & Evaluation

Specific reporting details and progress indicators and measurements of the City’s progress on improving air quality and climate change will be developed in consultation with stakeholders under the direction of the Climate Change Advisory Committee. This will be addressed further under Phase II of the long-term Plan.

## Departmental Roles & Responsibilities:

The City’s Public Works Department will be the corporate lead, supported by the Inter-Departmental Air Quality and Climate Change Working Group, on implementation of the Corporate Air Quality and Climate Change Strategic Plan. The delivery of direct municipal programs and services is a function of the Public Works Department. The lead department would administer the Inter-Departmental Air Quality and Climate Change Working Group.

<b>V</b> <b>Program Delivery</b>	<b>Lead Department</b>	<b>Roles &amp; Responsibilities</b>	
	<b>Public Works</b>	<ul style="list-style-type: none"> <li>▪ Identifying Responsibility of the Plan</li> <li>▪ Creating Internal Collaboration Reporting &amp; Structure for the Plan</li> <li>▪ Monitoring &amp; Evaluation of the Plan</li> </ul>	
		<b>Supporting Departments</b>	
		<b>All Departments</b> <b>Interdepartmental Working Group</b>	<ul style="list-style-type: none"> <li>▪ Ensuring Regulatory Compliance</li> <li>▪ Internal Collaboration</li> <li>▪ Identifying Alternative Service Delivery Opportunities</li> <li>▪ Monitoring &amp; Evaluation of Programs and the Plan</li> </ul>
<b>Stakeholders</b> <b>Climate Change Advisory Committee &amp; Clean Air Hamilton</b>		<ul style="list-style-type: none"> <li>▪ Implementation</li> </ul>	

## Recommendations

The following recommendations are initial steps the Corporation could undertake to build on Departmental activities to date, integrate these activities, and work in partnership with the community to address both air quality and climate change within the City of Hamilton.

- A) Adopt the idea that the Corporation of the City of Hamilton requires a comprehensive long-term strategic plan to address air quality and climate change concerns based on current actions and to address the present and future needs of the citizens of Hamilton.
- B) Host a Hamilton Climate Change Roundtable and invite the community to voice their interest, help identify community resources, and develop partnerships. Engage citizens on climate change and activities to reduce greenhouse gases at the community level. This roundtable forum could lead to the development of a Climate Change Advisory Committee for the City of Hamilton.
- C) Create an Inter-Departmental Air Quality and Climate Change Working Group with representatives of Departments within the Corporation who would engage and can promote activities to reduce air pollutants and greenhouse gases and adapt to climate change within City operations, policies and programs. This internal corporate group's work would feed into the Climate Change Advisory Committee to build partnerships to undertake joint programs/actions with the community on air quality and climate change.
- D) Undertake a City inventory of air pollutants and greenhouse gas emissions. Previous attempts at an inventory used pre-amalgamation data and the results are irrelevant to the current operations of the Corporation. In 1999, the City completed an analysis of the Corporate greenhouse gas emissions associated with the Region of Hamilton-Wentworth and the City of Hamilton for 1994 and 1998. The analysis showed greenhouse gas emissions from Corporate operations were reduced by 3.8% between those four years. However, with changes in Corporate structure and operations since amalgamation, comparisons with the 1998 data are difficult, if not impossible.
- E) Continue to support programs and partnerships that educate and initiate action to improve the local air quality and reduce greenhouse gases within the Corporation and in the City of Hamilton.

## Conclusion

The City has undertaken air quality and climate change initiatives since the early 1990s. Air Quality had been addressed through partnerships with HAQIC and now through Clean Air Hamilton.

Prior to amalgamation in 2001, two programs addressing climate change existed, the Region's Climate Protection Action Plan and the City's Greenhouse Gas Reduction Program. However, these programs were not yet combined after amalgamation. The Corporation maintained its network of sustainability and air quality programs which contribute to the mitigation and adaptation to climate change.

The City of Hamilton's Departments currently deliver a variety of policies and programs that address both air quality and climate change. However, a clear, coherent strategy to bring the current policies and programs together and that translate into a corporate effort to address both air quality and climate change in the form of a strategic plan is needed.

Where local air quality is a concern, greenhouse gas reduction strategies can be developed in concert with clean air initiatives and can result in actions that reduce both air pollutants and greenhouse gases, reduce costs and save corporate resources.

The Corporate Air Quality and Climate Change Strategic Plan Phase I builds on the current network of air quality and climate change policies and programs and attempts to combine and expand them into a strategic plan to address both air quality and climate change issues in a focussed approach.

The Corporate Air Quality and Climate Change Strategic Plan Phase I establishes lead departments within the Corporation that would work with the Inter-Departmental Air Quality and Climate Change Working Group in the delivery of the five action categories of the Plan with the support of Departments in the delivery of program areas to address air quality and climate change.

The Corporate Air Quality and Climate Change Strategic Plan Phase II will focus on the long-term implementation details of the Plan and new strategic actions of the corporation.

Ultimately, the long-term strategic Plan will help guide the City's future policies and operations in such a way to ensure the City's actions are consistent with the goals of improving air quality and mitigating the effects of climate change and greenhouse gas emissions in areas the City can influence.

The Corporate plan should not be seen as an isolated action but is dependent upon and supports activities undertaken by partners outside of the Corporation. Through partnerships and community engagement the corporate plan can be a component to build upon and create a City-Wide Hamilton Action Plan on Air Quality and Climate Change that engages the citizens of Hamilton.

## References and Sources of Information:

- Canadian Climate Impacts and Adaptation Research Network (C-CIARN) (2006)  
<http://www.c-ciarn-ontario.ca/english/science.html>
- Canadian Climate Impacts and Adaptation Research Network (C-CIARN) (2006)  
*Adapting to Climate change. An Introduction for Canadian Municipalities.* 32 pgs.
- Centre for Health and the Global Environment, Harvard Medical School (2005)  
*Climate Change Futures Health, Ecological and Economic Dimensions.* 142 pgs.
- City of Calgary (2004) *Corporate Climate Change Program Action Plan 2004.* 22 pgs.
- City of Hamilton (2004) *2004 Environmental Scan.* 71 pgs.
- City of Hamilton (2004) *Annual Sustainability Indicators Report* 180 pgs.
- City of Hamilton (2004) *Vision 2020 Corporate Action Inventory*  
<http://www.vision2020.hamilton.ca/achieve/city-action-inventory/default.asp>
- City of Hamilton (2005) *Public Works Community Report on Storm Water Management – When Mother Nature Strikes.* 4 pgs.
- City of Hamilton (2005) *City of Hamilton Water and Wastewater Master Plan Policy Paper (PW05050).* 18 pgs.
- City of Hamilton (2006) *Growth Related Integrated Development Strategy- Final Report.* 89 pgs.
- City of Hamilton (2006) *Energy Retrofit Pilot Program: Implementation Phase (PW06078/FCS06067).*  
Public Works, Infrastructure & Environment Committee- June 2006.
- City of Ottawa (2004) *Air Quality and Climate Change Plan.*  
[http://ottawa.ca/city\\_services/planningzoning/2020/air/](http://ottawa.ca/city_services/planningzoning/2020/air/)
- City of St. John's (2006) *Greenhouse Gas Emissions Reduction Strategy, City of St. John's Local Action Plan 2006-2010.* 39 pgs.
- Clean Air Hamilton (2004) *Clean Air Hamilton Progress Report 2003 -2004.* 29 pgs.
- Clean Air Hamilton (2006) *Clean Air Hamilton Progress Report 2004 -2005.* 55 pgs.
- The Clean Air Partnership (2005) *A Model Clean Air Plan for the Living City.* 56 pgs.
- The Clean Air Partnership (2006) *Adapting to Climate Change in Toronto.*  
[http://www.cleanairpartnership.org/climate\\_change.php](http://www.cleanairpartnership.org/climate_change.php)
- The Clean Air Partnership (2006) *A Scan of Climate Change Impacts on Toronto.* 50 pgs.
- Conference Board of Canada (2006) *Adapting to Climate Change Is Canada Ready?* 15 pgs.
- ECO5 Inc. (2004) *Hamilton's Vulnerability to Climate Change, GRIDS Background Study.* 41 pgs.
- Environment Canada (2006) *Clean Air Online.*  
<http://www.ec.gc.ca/cleanair-airpur/>
- Federation of Canadian Municipalities (2005) *Partners for Climate Protection.*  
<http://kn.fcm.ca/>
- Federation of Canadian Municipalities (2005) *Quick Action Guide: Municipal Action on Climate Protection.* 12 pgs.
- Gilbert, Richard (2006) *Hamilton: The Electric City.* 76 pgs.
- Global Change Strategies International Inc. (2003) *Municipal Risk Assessment: Investigation of the Potential Municipal Impacts and Adaptation Measures Envisioned as a result of Climate Change.* 52 pgs.

- Global Change Strategies International Inc. (2005) *An Overview of the Risk Management Approach to Adaptation to Climate Change in Canada*. 28 pgs.
- Government of Canada (2004) *Climate Change, Impacts & Adaptation: A Canadian Perspective*. 201 pgs
- Government of Canada (2005) *Moving Forward on Climate Change, A Plan for Honouring our Kyoto Commitment*. 55 pgs.
- Government of Canada (2006) *Government of Canada Climate Change Website*  
[http://www.climatechange.gc.ca/english/climate\\_change/](http://www.climatechange.gc.ca/english/climate_change/)
- Greater Vancouver Regional District (2005) *Air Quality Management Plan*. 12 pgs.
- Hamilton Community Foundation (2002) *The Future We Want: Strategic Focus on the Protection of Hamilton's Environment*. 26 pgs.
- Hyslop, Adam (2005) *Ontario's Emergency Management Act & Municipal Climate Change Strategies*. 11 pgs.
- Institute for Catastrophic Loss Reduction (2003) *Climate Change, Natural Hazards and Cities*. 16 pgs.
- Jerrett, Michael and Talar Sahsuvaroglu (2003) *A Public Health Assessment of Mortality and Hospital Admissions Attributable to Air Pollutants in Hamilton*. 47 pgs.
- Lay, Jennifer (2005) *Lessons Learned on Initiating a Municipal Corporate Climate Change Program*. 25 pgs.
- McGeehin, Michael and Maria Mirabelli, (2001). *The Potential of Climate Impacts of Climate Variability and Change on Temperature-Related Morbidity and Mortality in the United States*. Vol. 109, Supp 2.
- Natural Resources Canada (2006) *Office of Energy Efficiency*. <http://oee.nrcan.gc.ca/>
- Ontario Medical Association (2005) *The Illness Costs of Air Pollution*. 13 pgs.
- Pembina Institute (2004) *Climate Change Solutions for Municipalities*.  
<http://www.climatechangesolutions.com/municipal/default.shtml?o=intro>
- Pollution Probe (2002) *Towards an Adaptation Action Plan: Climate Change and Health in the Toronto-Niagara Region Summary for Policy Makers*. 50 pgs.
- Ridley, Justin (2005) *City of Hamilton's Greenhouse Gas Emissions Inventory: A Review*. 40 pgs.
- Rowan Williams Davies & Irwin Inc. (2005) *Development of Policy Papers for Phase Two of the Transportation Master Plan for the City of Hamilton AIR QUALITY POLICY PAPER*. 31 pgs.
- Rowan Williams Davies & Irwin Inc. (2005) *Development of Policy Papers for Phase Two of the Transportation Master Plan for the City of Hamilton TRANSPORTATION ENERGY USE AND GREENHOUSE GAS EMISSIONS POLICY PAPER*. 25 pgs.
- Regional Municipality of Hamilton-Wentworth (1997) *Climate Protection Action Plan, Impacts and Reduction Efforts for Municipal Operations*. 27 pgs.
- Union of Concerned Scientists and the Ecological Society of America (2003) *Confronting Climate Change in the Great Lakes Region. Impacts on Our Communities and Ecosystems*. 92 pgs.
- United States Environmental Protection Agency (2006). *Global Warming*  
<http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html>

## APPENDIX A:

### **The Corporate Air Quality and Climate Change Strategic Plan – Framework**

The following chart outlines and visualizes the structure to the Corporate Air Quality and Climate Change Strategic Plan. This chart is a framework model of the Plan and should be consulted when reading this report.

**Corporate Air Quality & Climate Change  
Strategic Plan  
Phase II**

# Corporate Air Quality & Climate Change Strategic Plan Report

## Table of Contents

	<b>Page</b>
Executive Summary.....	4
Introduction.....	5

### Part I – Background

A) Climate Change .....	6
B) Air Quality .....	9
C) Municipal Greenhouse Gas Emissions – An Overview.....	10
D) A Corporate Air Quality & Climate Change Strategic Plan .....	11

### Part II – Corporate Actions

A) Adaptation & Reduction of Greenhouse Gases.....	11
a) Adaptation & Risk Management .....	12
b) Emergency & Health Response .....	13
c) Water Quality & Supply.....	14
d) Tree Planting & Preservation.....	16
e) Land-Use Planning.....	18
i) Growth Management .....	18
ii) Intensification.....	19
iii) Protection of the Natural Heritage System .....	19
iv) Community Design .....	20
v) Urban Design .....	20
vi) Community Improvement Plans .....	20
f) Built Environment.....	21
i) LEED – Leadership in Energy & Environmental Design.....	23
ii) Green Development Standards.....	23
g) Transportation & Transportation Planning .....	24
i) Personal Transportation Options - Biking .....	27
ii) Transportation Demand Management.....	28
iii) Greening the Corporate Fleet .....	30
iv) Transit.....	31

v) Idling Control .....	33
h) Energy Conservation & Demand Management.....	34
i) Waste Management and Reduction.....	38

**Part III – Implementation & Delivery**

A) Delivery of Corporate Actions on Air Quality & Climate Change .....	45
a) Corporate Air Quality & Climate Change Working Group.....	46
i) Senior Management Team & City Council.....	47
ii) Clean Air Hamilton.....	47
iii) Climate Change Roundtable.....	48
b) Corporate Emissions Inventory.....	48
c) Research on New Policies & Strategies.....	49
d) Response, Engagement & Communications.....	50
B) Implementation of Corporate Actions on Air Quality & Climate Change .....	50
Recommendations.....	51
Conclusions.....	54
References & Sources of Information.....	55

**Appendices**

- A – Vision 2020 Goals in the Corporate Air Quality and Climate Change Strategic Plan**
- B – Government Actions on Climate Change**
- C – Corporate Air Quality and Climate Change Actions**

## EXECUTIVE SUMMARY

Increasing greenhouse gases leading to climate change and poor air quality will continue to have impacts on community health, the environment and the economy of Hamilton.

Transportation, energy use, industry, land-use planning, and the built environment are areas that contribute to significant air and climate change emissions within Hamilton and that the City can influence or address in its own corporate operations, services and policies. However, the time needed and significance of each area's contribution to the goals of improving air quality and reducing greenhouse gases will vary significantly.

The Kyoto Protocol on Climate Change establishes Canada's commitment to reducing greenhouse gases to 6% below 1990 levels from 2008 to 2012. The Kyoto Protocol entered into force internationally in 2005.

The City of Hamilton supports the objectives of the Kyoto Protocol. The Corporate Air Quality and Climate Change Strategic Plan recognizes the need to reduce greenhouse gases while improving air quality. The Corporation will strive to reduce greenhouse gas emissions in its operations starting with a 10% reduction of 2005 levels by 2012, followed by a 20% reduction by 2020.

The Corporation has already begun to address air and greenhouse gas emissions in the areas of responding to smog days, greening the fleet, waste, water, energy conservation and demand management, land-use and transportation planning, and idling. The City supports programs and partnerships with community groups to address air quality and the impacts of climate change through local initiatives such as Trees Across Hamilton, the Commuter Challenge, the Idling Stinks education program, and Wise Water Use.

Partnerships with community stakeholders outside of the Corporation and co-ordination of efforts with the broader Hamilton community are essential. The City of Hamilton will work with local community groups, academic and industry partners and other levels of government to ensure that action on air quality and climate change is taken - locally, provincially and globally.

To build upon the action already undertaken by the Corporation, and to continuously improve local air quality and address climate change, areas of increased focus in the short and medium term should include:

- Transportation:
  - Increased support of Transit within the City
  - Increased Transportation Demand Management and encouragement of alternative modes of transportation (walking, cycling, carpooling, teleworking) and discouragement of single occupancy in vehicles
- Investing in the "Green Infrastructure" to adapt and mitigate impacts.
  - Focus on forestry in urban areas – encourage more sustainable tree canopy
  - Encouragement and Development of green buildings and standards
- Undertake Adaptive planning to reduce the risks of climate change impacts in policies and actions

In the short term, a comprehensive greenhouse gas emissions inventory to quantify actions and results will be undertaken by the Corporate Air Quality and Climate Change Working Group to provide necessary information for further corporate strategic action and to measure results and targets.

## INTRODUCTION

Increasing awareness and scientific support of climate change and associated impacts such as extreme weather events and influences on local environments including poor air quality have resulted in municipalities starting to reduce the amounts of greenhouse gas emissions from their operations and services, and educate their citizens. Municipalities have also begun to understand the need to adapt to the risks of a changing climate.

Municipalities have an important role to play in improving local air quality and addressing climate change given the types and levels of services they provide their citizens through public works, health services and planning.

The Corporate Air Quality and Climate Change Strategic Plan recognizes the City of Hamilton as a corporate entity including its municipal operations and as an implementer of programs and policies that address air quality and climate change within its operations. The role of the City of Hamilton as the “governor of the community” or the geographical district know as Hamilton is not the focus of this report.

Canada signed the Framework Convention on Climate Change in 1992, among other international legal obligations, it committed to adopting policies and measures to reduce greenhouse gas emissions and promote adaptation to climate change. In 1998 Canada adopted, then ratified in 2002, the Kyoto Protocol and pledged to reduce Canada's greenhouse gas emissions to six percent below 1990 levels during the commitment period of 2008 to 2012. The Corporate Air Quality and Climate Change Strategic Plan captures the intent of the Kyoto Protocol by recognising the need to take action on climate change in corporate operations and policies.

Through the Federation of Canadian Municipalities (FCM), the City of Hamilton urged Canada to support and ratify the Kyoto Protocol. The City of Hamilton continues to support actions on addressing climate change through Hamilton's Vision 2020 Strategy.

Hamilton's Vision 2020 Strategy has the following air quality and climate change goals:

- *To ensure the City has the best air quality of any major urban centre in Ontario;*
- *To have effective plans that identify, reduce and manage risks; and,*
- *To reduce greenhouse gas emissions*

The goals of the Vision 2020 Strategy have been incorporated into the Corporate Air Quality and Climate Change Strategic Plan through the recognition of the air and climate change goals and other areas of the Vision 2020 Strategy including transportation, land-use, water, waste, and energy. A full listing of the Vision 2020 Strategy goals endorsed by the Corporate Plan can be found in **Appendix A**.

This report highlights the environmental initiatives that the Corporation has undertaken, or is beginning to undertake, and brings them together in a strategic manner to address improvements in air and address climate change. The report also highlights the areas that need to be addressed by the Corporation to combat climate change in the short and medium term.

## **PART I -BACKGROUND**

This section provides a brief overview on the issues of climate change and poor air quality, as well as the sources of municipal emissions.

It is important to recognize the complexity of climate change and air quality, the risks associated with climate change, and the municipal sources of emissions in the development of strategic corporate actions and priorities in Hamilton.

### **A) Climate Change**

Climate Change refers to the long term change in average weather patterns resulting from the release of substantial amounts of greenhouse gases (GHGs), such as carbon dioxide, methane, nitrous oxide, etc. into the planet's atmosphere. These emissions alter the chemical composition of the atmosphere, resulting in intensification of the earth's natural greenhouse effect.

Climate change can be caused by natural processes, such as a change in the sun's strength, and by human activities. Scientific consensus has been reached that increased fossil fuel use and permanent forest loss since pre-industrial times has resulted in atmospheric concentrations of greenhouse gases growing significantly, leading to accelerated changes in our climate.

**Table 1: Key Greenhouse Gases and Sources**

<b>Symbol</b>	<b>Name</b>	<b>Sources</b>
<b>CO<sub>2</sub></b>	Carbon Dioxide	Fossil fuel combustion, forest clearing, cement production, etc.
<b>CH<sub>4</sub></b>	Methane	Landfills, production and distribution of natural gas & petroleum, livestock manure, sewage waste treatment, fossil fuel combustion, etc.
<b>N<sub>2</sub>O</b>	Nitrous Oxide	Fossil fuel combustion, fertilizers, etc.
<b>HFC's</b>	Hydrofluorocarbons	Refrigeration gases, aluminium smelting, semiconductor manufacturing, etc.
<b>PFC's</b>	Perfluorocarbons	Aluminium production, semiconductor industry, etc.
<b>SF<sub>6</sub></b>	Sulfur Hexafluoride	Electrical transmission and distribution systems, circuit breakers, magnesium production, etc

Climate change is predicted to have several impacts. These include:

- Humans and societal infrastructure will be vulnerable to several types of extreme weather events, including droughts, intense precipitation, extreme temperature episodes, high winds, and severe storms from which they are currently unprepared.
- Changes in the frequency of severe storms and associated safety risks.
- The overcharging from urban sewage systems is likely to increase.

- Increased temperature, especially extreme heat, which contributes to heat stress in the elderly and ill.
- Accelerated changes to natural ecosystems, stress on wild animal populations and erosion of arctic/northern climate ecosystems.
- Increased favourable conditions for a number of pests (insects, rodents, disease vectors)
- Increase in weeds and pollen resulting in an increase in allergy attacks in individuals.
- Average water levels in the Great Lakes are expected to decrease and become variable resulting in impacts on water supply and quality (groundwater and surface water) and concerns in commercial and recreational transportation.
- Reduced water levels in lakes which may concentrate pollutants and toxins requiring changes to water purification practices.
- Altered precipitation and temperature regimes will affect seasonal patterns in water levels in waterways and wetlands, thereby affecting their functioning in flood protection, water cleansing, and waterfowl/wildlife habit and their use in recreational pursuits (fishing, camping, and boating).
- Increased maintenance costs for transportation, with variable freeze-thaw cycles, increased pavement buckling due to longer periods of intense heat and shifts from less snow to more freezing rain.
- Increased demand for building cooling through increased use of air conditioning resulting in higher energy consumption and associated greenhouse gas and air pollutants.
- Changes (extreme droughts, floods, shifting produce, weeds and insects) in agriculture may affect the supply of foods.
- Insurance and reinsurance industries that may already be burdened may increase liability costs or remove coverage as the risk associated with investment in property, infrastructure and resource-base industries increases.<sup>1</sup>

Overall, climate change, combined with poor air quality, will place major stresses on built infrastructure (buildings, roadways, sewer systems), “green” infrastructure (watersheds, trees and parks), the health infrastructure (combating respiratory and cardiovascular, stress, and disease), social support systems (emergency response), and the economy. Many negative impacts of climate change can be reduced through preventative measures (mitigation); others must be adapted to, while the remaining impacts may have to be borne.

In 2006, Canada's total greenhouse gas emissions reached an estimated 747 Megatonnes of carbon dioxide (equivalent), up 25% from 1990. In terms of individual greenhouse gases, 78% of the 2006 emissions were attributed to carbon dioxide, 15% to methane and 6% to nitrous oxide. Sulphur hexafluoride, PFCs and HFCs accounted for the remaining 1%.

#### **What is one tonne of Greenhouse Gases (GHGs)?**

- Greenhouse Gases are measured in tonnes of carbon dioxide
- 1 Mt (mega tonne) is 1 million tonnes of carbon. 1 Mt of carbon is equivalent to 3.67 million tonnes of carbon dioxide. Carbon dioxide, the most abundant greenhouse gas produced, is used as the standard to which greenhouse gases are measured against and is referred to as eCO<sub>2</sub>
- The volume of one tonne of GHGs would fill a two-storey, three-bedroom house
- The average Canadian produces approximately 5 tonnes of greenhouse gas emissions each year so one tonne is a reduction of about 20%
- An automobile produces approximately 5 tonnes/year of CO<sub>2</sub> equivalents

<sup>1</sup> Weather related insurance losses multiplied more than 13 times between 1960 and 1999.

It is important to note that Canada's greenhouse gas emissions vary from region to region and are linked to the distribution of natural resources and heavy industry within the country. Particular provinces tend to produce more greenhouse gas emissions because of their economic and industrial structure and their relative dependence on fossil fuels for producing energy. Ontario is recognized as one of the highest emitters of greenhouse gases at 200 million tonnes of CO<sub>2</sub> equivalents.<sup>2</sup>

In 2007, the United Nations Commission on Sustainable Development convened an international panel of scientific experts to prepare a report outlining the best measures for mitigating and adapting to climate change. The panel's conclusion is that a two-pronged strategy is needed: avoid the unmanageable (mitigation) and manage the unavoidable (adaptation).

The key United Nations recommendation is the creation and rebuilding of cities to be climate resilient (adaptation) and GHG-friendly (mitigation). Action items to take advantage of the most advanced technologies and approaches for using land, fresh water, terrestrial, and energy resources include the following elements:

- Modernize cities and plan land-use and transportation systems, to support greater use of public transit, to reduce energy use and greenhouse gases and increase the quality of life and economic success of citizens.
- Improve the design and efficiency of commercial and residential buildings through building codes, incentives for property developers and landlords to build and manage properties efficiently, and financing for energy-efficiency investments; Construct all new buildings using designs appropriate to the local climate, and upgrade existing buildings to reduce energy demand and slow the need for additional power generation.
- Promote reforestation and improved land-use practices in ways that enhance productivity and delivery of ecological services while reducing emissions.
- Expand the use of biofuels, especially in the transportation sector, through energy portfolio standards and incentives, with careful attention to environmental impacts, biodiversity concerns, and energy and water inputs.
- Undertake performance measures that monitor the progress of energy and greenhouse gas reductions.
- Promote lifestyles, adaptations, and choices that require less energy and demand for non-renewable resources.

## **B) Air Quality**

Sources of air pollutants are varied but primarily stem from the industrial and transportation sectors. The key air pollutants are released when fossil fuels such as coal, oil, gasoline, diesel and natural gas are burned for the purposes of transportation or energy in both

---

<sup>2</sup> Environment Canada -Canada's 2005 Greenhouse Gas Inventory

industrial and personal uses. These same sources also generate greenhouse gases that contribute to climate change.

### Hamilton's Six Key Air Pollutants:

Nitrogen dioxide (NO <sub>2</sub> )	Ground level ozone (O <sub>3</sub> )
Inhalable particulate matter (PM <sub>10</sub> )	Respirable particulate matter (PM <sub>2.5</sub> )
Sulphur dioxide (SO <sub>2</sub> )	Carbon Monoxide (CO)

Poor air quality has significant direct and indirect impacts on the health, environment and economy of Hamilton. Strong scientific evidence supports the linkages between air pollutants (ozone, nitrogen oxides, carbon monoxide, and airborne particulates) and significant respiratory and cardiovascular ailments. The impacts of air pollutants on health and the environment can be exacerbated by higher temperatures and humidity brought about by changes in the local climate.

Health estimates demonstrate that poor air quality continues to present a substantial risk to the health of residents in Hamilton.

*Clean Air Hamilton* was established in 1998 under the former Hamilton-Wentworth Air Quality Initiative and serves as an independent multi-stakeholder research and advisory committee to the City on issues of air quality in Hamilton.

In 1997 and 2003, *Clean Air Hamilton* undertook research regarding air pollution and health on Hamiltonians. It has been estimated that five key air pollutants – nitrogen dioxide, ground level ozone, fine particulate matter, sulphur dioxide and carbon monoxide - contribute to approximately 100 premature deaths and 620 hospital admissions in Hamilton each year.

In 1998, the Ontario Medical Association (OMA) declared air-pollution “a public health crisis.”<sup>3</sup> According to a 2005 report from the OMA, air pollution was responsible for an estimated 5,800 premature deaths, almost 17,000 hospital admissions and close to 60,000 emergency room visits in Ontario in 2005.<sup>4</sup>

According to *Clean Air Hamilton*:

- The transportation sector is the leading source of Nitrogen Oxide (NO<sub>x</sub>) emissions within the city, followed closely by the industrial sector.
- The industrial sector is the leading source of directly-emitted particulate matter followed by road dust and area sources such as fireplaces, home heating and businesses.
- Industry is by far the leading source of Volatile Organic Compounds, Sulphur Dioxide, and Carbon Monoxide.

Clean air strategies help in the fight against climate change, as measures that promote efficient land use, efficient use of fossil fuels and/or a switch to cleaner sources of energy will reduce emissions of both smog pollutants, greenhouse gases, and increase health.

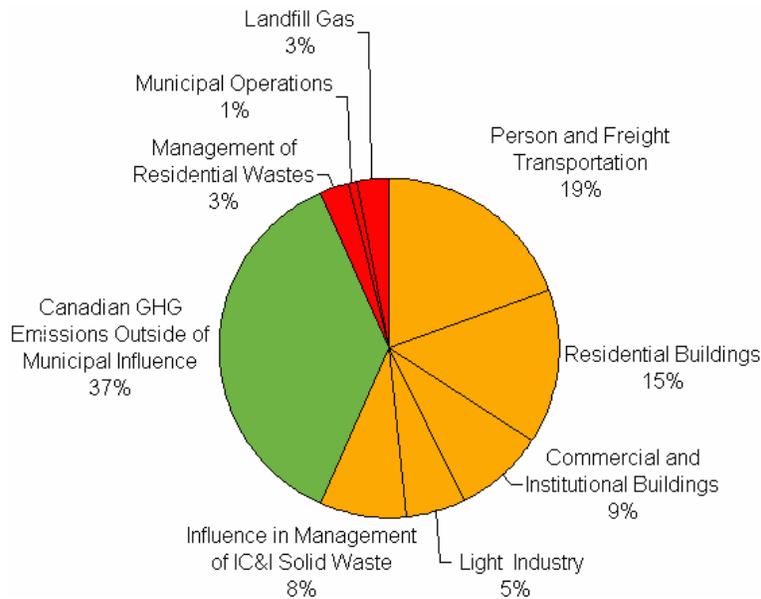
## C) Municipal Greenhouse Gas Emissions – An Overview

<sup>3</sup> Ontario Medical Association: News release May 12, 1998, “*Beware the Air You Breathe: Ontario’s Doctors Call for Cleaner Air*”

<sup>4</sup> Clean Air Hamilton: 2004-2005 Progress Report

According to the Federation of Canadian Municipalities (FCM), up to half of Canada's greenhouse gas emissions (360 Megatonnes (Mt)) are under the direct or indirect control or influence of municipal governments. Municipalities directly control decisions that produce some 38 Mt of greenhouse gas emissions from municipal operations, residential waste, and landfill sites. Greenhouse gas emissions under the indirect (regulatory, public policy, and community awareness) control of municipal governments total 322 Mt.

**Figure 1: Canadian Greenhouse Gas Emissions Directly & Indirectly Controlled by Municipalities Compared to Total National Emissions (1990).**



By 2012, the Federation of Canadian Municipalities estimates that communities could cut greenhouse gas emissions by 20 to 50 Mt from municipal operations and community-wide initiatives with investments in environmental infrastructure and sustainable transportation infrastructure. Municipal governments can reduce emissions through:

- land-use, energy, and transportation planning and management;
- infrastructure design and adaptation planning;
- green procurement;
- green fleets (hybrid, alternative fuels, right-sizing);
- building retrofits;
- energy conservation and efficiency;
- green development standards;
- water conservation and efficiency;
- solid waste diversion and reduction; and
- using renewable energy.

Efforts to reduce air pollutants and greenhouse gas emissions from municipal operations could produce economic benefits for the Corporation and improve the quality of life in the City. They could produce energy and operating costs savings, encourage renewal of physical assets, and improve the delivery of municipal services.

#### **D) A Corporate Air Quality & Climate Change Strategic Plan**

Departments run a variety of policies and programs that address air quality and climate change. Some have been expressly created for that purpose, while many others make a direct contribution to air quality and climate change issues as they pursue other goals. A clear, coherent strategy is needed to bring the current policies and programs together and translate corporate effort to more effectively address both air quality and climate change by a strategic action plan.

In August, 2006, City Council recognized the need to begin developing a comprehensive strategy to address climate change and air quality in Corporate policies and operations<sup>5</sup>.

The approved Corporate Air Quality and Climate Change Strategy outlined 5 action categories to be addressed by the actions of City Departments:

- I. Research that Informs Policies and Strategies;**
- II. Response, Engagement & Communication;**
- III. Adaptation to Smog & Climate Change;**
- IV. Reducing Emissions, Key Pollutants & Greenhouse Gases; and;**
- V. Delivering Air Quality and Climate Change Programs.**

This report outlines the initial elements and actions of the Corporation of the City of Hamilton under a comprehensive strategic plan to address climate change and air quality.

## **PART II – CORPORATE ACTIONS**

This section provides information on specific areas (smog response, water quality & supply, transportation, land use planning, energy, and waste) and the related climate change and air quality issues therein.

Current actions of the corporation in addressing these areas are highlighted and future actions that can address air quality and climate change are recommended. These corporate activities serve as the baseline and respective future actions under the Corporate Air Quality and Climate Change Strategic Plan.

### **A) Adaptation & Reduction of Greenhouse Gases**

Addressing climate change requires two types of actions: adaptation and mitigation (i.e. reduction). Adaptation involves actions or planning to minimize citizens or infrastructure's vulnerabilities to the impacts of climate change. Mitigation involves actions aimed at reducing greenhouse gases. Adaptation and mitigative actions are complimentary.

Adaptation includes technical adaptation (e.g. new technology or resources that reduce dependency on non-renewable natural resources and energy constraints); environmental adaptation (e.g. responding to the changes in natural systems such as water, air, and forests); and social adaptation (e.g. changes in personal behaviour and social/community support services).

Adaptation does not need to be dramatic or disruptive. It can include minor changes to established activities and practices within an organization. Preparing for events reduces the risk of an organization's vulnerabilities to the impacts of climate and/or poor air quality.

---

<sup>5</sup> The 2006 Phase I Report (PED06336)

Reduction, or mitigation, is directed at reducing atmospheric concentrations of air pollutants and greenhouse gases resulting from municipal operations and services (i.e. areas of direct control or influence by the Corporation). Mitigation involves actions meant to avoid or delay the occurrence of climate change.

Reduction strategies should:

- Define actions to reduce greenhouse gases and improve air quality in corporate operations, and
- Encourage actions by staff to reduce their personal emissions to improve air quality and retard climate change.

### **A. a) Adaptation & Risk Management**

Municipalities run the risk of suffering from the impacts of climate change from more frequent storms, droughts, floods, heat waves, poor air quality days, invasive species and diseases. Corporate actions need to include an element of preparation and risk protection that the Corporation cannot directly control but can still prepare for.

In 2004, the City of Hamilton undertook a vulnerability scan of climate change impacts through the GRIDS (Growth Related Integrated Development Strategy) process to identify risks and the City's adaptive capacity to climate change. The report concluded that climate change should be addressed by the City and considered in the planning of City development and infrastructure (ECO5 Inc., 2004).

The City of Toronto has identified the need to begin addressing adaptation and examining the vulnerabilities of their operations to climate change. The Toronto Clean Air Partnership has been undertaking projects looking at Adapting to Climate Change in Toronto. The Alliance for Resilient Cities (ARC) is a recent collaborative network of decision-makers that supports the efforts of local governments to identify the impacts of climate change, analyze adaptation options and develop action strategies to protect their communities. The City has been engaging with the Alliance to learn more on adapting to climate change.

#### **Action:**

- **Undertake vulnerability scans of climate change impacts on municipal operations.**
- **City Council should direct all departments to take appropriate action to incorporate responses to potential risks of climate change into corporate operations.**
- **Develop a Corporate Climate Change Adaptation Strategy**

### **A. b) Emergency & Health Response - Adaptation**

Natural hazards pose a threat to cities, measured in physical disruption of infrastructure, human health effects and economic losses from damage and lost productivity. Weather hazards include tornadoes, hailstorms, winter storms, heat waves, drought, storm surges, and floods. Climate change is expected to alter the frequency and/or severity of hazards that surround cities, demanding adaptation to reduce catastrophic loss (Institute for Catastrophic Loss Reduction, 2003).

Hamilton is not exempt from the effects of climate change. The City's 2004 Environmental Scan points out that "research indicates that future weather patterns in Southern Ontario will

fluctuate to an increasing degree. Adverse weather conditions will become more intense and less predictable.”

Winter storms cause more than 100 deaths in Canada every year.<sup>6</sup> Similarly heat waves can have a substantial impact on human health by exasperating the risk of heart attack or worsen medical conditions such as diabetes. Extreme heat can result in dehydration, heatstroke, heat cramps, and heat exhaustion in healthy populations. The very young and elderly are the most vulnerable to extreme weather events because they have a more limited capacity to regulate their body temperatures through prolonged extreme temperatures. At greater risk are those who lack access to proper heating, air conditioners or cool recreational facilities needed for relief from excessive heat. Heat waves are expected to increase in Southern Ontario with climate change.<sup>7</sup>

Extreme Cold or Heat Alerts, conducted by a local health unit, could identify potential shelters, both public and private, (community centres, libraries) and areas where there are large numbers of seniors. These alerts would also include: the use of a temperature index, declaration of cold or heat emergency and response plans, requesting hostels/shelters to stay open, and having city nursing staff visit people at risk. (Health Canada, 2003)

Hamilton Public Health Services issues media advisories for extreme cold or heat events and works with community agencies on actions to protect the vulnerable from extreme weather conditions. The actions for extreme cold alerts include transporting and sheltering of people who are at particular risk.

In 2007, Hamilton introduced a hot weather protocol, in which includes a three stage classification of the heat event. In the event of a Heat Alert (the third and most severe heat event), the City Emergency Control Group will be convened, a cooling center will be provided downtown, and outdoor City swimming pools will have extended hours<sup>8</sup>. It has been suggested that heat alert programs be strengthened through coordination with public air quality advisories.<sup>9</sup>

Studies have suggested that climate change and extreme weather affects the breeding and range of disease vectors. Warm, wet weather encourages insects and bacteria proliferate. Increased flooding and precipitation may increase the transmission of pathogens and parasites from other animals to humans through the water system.

To reduce the health risks of climate change, emergency and health planning responses should consider scenarios of extreme weather such as flooding, drought, wind storms, extreme cold and heat on citizens in their emergency preparedness protocols.

The Ontario Emergency Management and Civil Protection Act (EMA), amended in 2006, outlines the responsibilities of local/municipal and provincial government in the mitigation and management of emergency situations. It requires all Ontario municipalities to develop comprehensive, risk-based emergency management programs based on planned emergency prevention, preparedness, response and recovery.

---

<sup>6</sup> Institute for Catastrophic Loss Reduction: *Climate Change, Natural Hazards and Cities*, 2003

<sup>7</sup> McGeehin, and Mirabelli, *The Potential of Climate Impacts of Climate Variability and Change on Temperature-Related Morbidity and Mortality in the United States*. Vol. 109, Supp 2, *Environ Health Perspect*. May 2001

<sup>8</sup> City of Hamilton Public Health Services, *Heat Alerts and Response* (BOH07024), May 2007.

<sup>9</sup> Pollution Probe, *Towards an Adaptation Action Plan: Climate Change and Health in the Toronto-Niagara Region*, 2002

The City of Hamilton Emergency Management Program has been in effect since the 1990's. The Program presents an opportunity to address the risks of extreme weather events resulting from climate change.

**Action:**

- **Enhance disaster preparedness and emergency response plans. Strengthen emergency communications, emergency preparation, public education, and emergency response coordination (e.g. planning for the combat of infectious diseases, illness, temperature and poor air quality induced health impacts)**
- **Develop and maintain a comprehensive risk based analysis procedure, in conjunction with the vulnerabilities scan, to determine climate change based high risk events in order to support co-ordinated inter-departmental mitigation programs to reduce risks and vulnerabilities.**

**A. c) Water Quality & Supply – Adaptation**

Climate change is forecasted to have impacts on water supply and quality, in combination with increased demand. Impacts are predicted to range from lowered lake and river levels, increased moisture deficits and local droughts, to increased extreme precipitation with increased flooding.

The City's Integrated Water and Waste Water Master Plan for the Lake Based Systems (2006) provides Hamilton with a water and wastewater servicing strategy for the lake based systems to support GRIDS. The plan identified upgrades required to service existing residents, address water quality issues in Hamilton Harbour, and support growth of Hamilton over the next 30 years. One of its policies is for the City to maintain sufficient reserve capacity in its water and wastewater infrastructure and facilities to provide operational flexibility and meet potential changes in servicing conditions (such as power failures, growth rates and fluctuating demands).

The City of Hamilton accepted an invitation to participate in the Great Lakes and St Lawrence Cities Initiative (GLSLCI) Water Conservation Framework. This is a voluntary program by which Cities commit to reductions in water use. The target reduction by year 2015 is 15% below a year 2000 baseline. The Public Works Department has undertaken various initiatives to conserve water and educate the public. The City has already achieved considerable water savings since 2000 and will be meeting this objective prior to 2015.

A large contributor has been the City's Water Metering Program. In 2002, the City moved from a partial flat rated water charge to implement a fully metered system. Since that time, the number of metered unit users has risen from 60,000 to more than 132,000. On the municipal water system, 99.8% of homes have had water meters installed.

Studies have shown that when water meters are initially installed, as much as a 20% reduction in water use can be realized as water consumers pay for what they use. Within 2 to 3 years, water consumers tend to return to old water use habits and consumption stabilizes with an approximate 10% reduction. In partnership with Green Venture, the Wise Water Use program is designed to educate citizens on the importance of local water sources and methods of water conservation. The Wise Water Use program has reached approximately 150,000 people and Green Venture has directly engaged approximately 50,000 water users.

The City's water use reduction from full metering has consistently maintained reductions of more than 10%. With daily residential household use in 2003-2004 averaging 800 litres (approximately 350 litres per capita day [lcd]), daily household average use fell to 760 litres

(330 lcd) in 2005 and fell again in 2006 to 710 litres (309 lcd). The current average for 2007 is 620 litres (270 lcd), representing an overall reduction from 2003 of 11.3 to 22.5%.

In 2008, a Water Efficiency Master Plan is to be proposed. The Master Plan is proposed to apply to residential, institutional, commercial and industrial users and is proposed to consider measures such as public education, new codes and standards, consumption based metering, municipal retrofits of household water efficiency devices (i.e. low flow showerheads, low flush toilets), system leakage detection and low water use landscaping.

The City is collaborating with members of the Canadian Water and Wastewater Association's Network Efficiency Committee. Water culled from efficiency programs is available, with approval from the Ministry of the Environment, as reserve capacity; it can defer the need for new supply infrastructure and thus is the least cost option for any new supply requirements. Water efficiency contributes to reductions in chemical and pumping energy usage, and a commensurate reduction in the amount of wastewater requiring treatment.

Water efficiency programs have little environmental footprint, and contribute to an overall reduction in greenhouse gas emissions. An updated corporate greenhouse gas inventory will identify how water usage and greenhouse gas emissions are linked for future corporate efficiency improvements. Through efficiency programs, achievable reductions are typically at 15 to 25%. This represents more than 40,000 cubic metres of treated water a day based upon current City flow rates.

Hamilton's storm water management programs are pivotal to improving source water quality. Unpredictable and extreme precipitation events will challenge the design capacity of water collection and conveyance systems, and multiply the probability of flooding. Excess runoff from overwhelmed storm and sewer systems permit the release of contaminants into local water bodies.

During the summers of 2004 to 2006 the City experienced heavy rainstorms causing sewer back ups and resulting in property damage and financial losses of totalling hundreds of thousands of dollars (Independent Community Panel (SERG), 2006). Hamilton also experienced flooding in parks and recreational areas, underpasses and erosion in streams and in areas outside the combined sewer network of the older City.

In response, the City formed an independent community panel called SERG (Storm Event Response Group) to explore the causes and effects of extreme weather on Hamilton's storm management/drainage systems and review the stormwater and wastewater master plans.

The panel concluded that the majority of Hamilton's stormwater management infrastructure works well but some areas could benefit from improvements. SERG also indicated opportunities for stream remediation in natural water courses as well as opportunities to improve existing stormwater retention through the use of natural processes and functions such as absorbent soils, additional trees, and increasing the canopy cover to intercept rainfall and enhance transpiration of runoff.

Although the mandate of the group did not include climate change, the SERG report (2006) did indicate that climate change would be a continuing factor and that the City undertake a proactive approach to designing for severe storm events in stormwater infrastructure planning.

Changes in temperature and precipitation patterns accordant with climate change may lead to earlier spring runoff and lower summer water levels, while intense rain events may result in more flooding. Wetlands will typically deliver steady baseflow, but in isolation do not necessarily perform well as flood prevention structures. Wetlands are most effective as

components of larger designs which account for both storm and inter-storm water conditions rather than for a handful of individual events. The City has integrated its design models into the Stormwater Master Plan component of GRIDS.

The City undertook the City-wide Stormwater Master Plan to provide strategies for the City's stormwater system (including storm trunk sewers) for the next 30 years. It is also a strategy to protect, enhance and restore the environmental resources within Hamilton's 15 watersheds. The Stormwater Master Plan recommends several types of measures to ensure that development practices for stormwater management in the City are sustainable. These measures include source control through measures such as green roofs, downspout disconnection and rain barrels, etc. the incorporation of infiltration into stormwater conveyance measures, enhanced use of vegetated buffer strips, the retrofitting of 29 stormwater pond facilities, stream restoration measures, and increase tree coverage.

**Action:**

- **Consider impacts on local air quality and reduction of greenhouse gases in City water & wastewater operations on a continual basis**
- **Incorporate climate change factors in Environmental Assessments used in the planning of water, wastewater and stormwater infrastructure and policies to ensure adaptive response to a changing climate.**
- **Promote greater water conservation in Hamilton to ensure adequate supplies of water under extreme weather scenarios (flooding, drought, lower lake levels, brownouts)**

**A. d) Tree-Planting & Preservation – Adaptation & Mitigation**

Trees absorb carbon to off-set the release of greenhouse gases by other sources; they offer shade that can protect from the damaging effects of the sun's ultra-violet light. They can provide cool retreats against heat waves; and they help remove many pollutants from the atmosphere.

Studies in Oakville and New York have estimated the benefits of trees financially and environmentally. New York's City street trees provide an annual benefit of about \$122 million and the City receives \$5.60 in benefits for every dollar spent on trees, including costs associated with planting and upkeep.

An effort to improve air quality through the commitment to establish an Urban Forestry Management Plan found Oakville's urban forest of 29.1% forest canopy coverage was responsible for filtering 172 tonnes of pollutants - all of the local industrial and commercial emissions of particulate matter (PM<sub>10</sub>) and 7% of PM<sub>2.5</sub> and over two times the amount of sulphur dioxide plus other criteria pollutants. A total of 22,000 tonnes of carbon dioxide were filtered and 6,000 tonnes of carbon were sequestered. While local air pollution is reduced, Oakville's urban forest does not filter a significant volume of the trans-boundary pollutants coming into Halton Region's airshed.

The value of the ecological services provided annually by trees within the Town of Oakville is \$2.1 million. In addition, trees save the local industry \$1.1 million each year by avoiding the expenditure on mechanical abatement measures to remove 172 tonnes of pollutants emitted at source. Trees save Oakville residents \$812,000 annually in reduced energy bills. This annual revenue potential through emissions trading arising from Oakville's qualifying carbon credits was \$5,191.

The Trees Across Hamilton program was initiated to undertake community based naturalized tree plantings in each Ward. In 2005 the program was carried out over six weekends with volunteers, Ward Councilors, and staff participating in the tree planting events. In total, 3,000 tree whips and 2,000 seedlings were planted in thirteen locations. In 2006, the program saw the planting of 2,300 trees in 12 areas across the City.

The City of Hamilton has undertaken steps to improve the service trees provide to the airshed and adapting to climate change. These include street tree trimming and planting programs, an Urban Forest Health Program to monitor and respond to forest health issues, and a consolidated Tree by-law to protect and guide management of public tree infrastructure. In 2007, a total of 7,144 street trees were planted in Hamilton through the Street Tree Planting program.

#### **Rural Official Plan - Targets for Natural Cover**

*The City's objective is to expand and reinforce the existing Natural Heritage System in the long term by encouraging and undertaking ecological reparation towards locally established targets.*

*Forest cover (Rural & Urban) was estimated at 17.7%, the target is 30%\**

*Wetland coverage was estimated at 8.3%, the target is 10%*

\*Based on Environment Canada's (2004) report, "A Framework for Guiding Habitat Restoration in Great Lakes Areas of Concern".

Although the Rural Official Plan established targets for natural cover, support is needed for a comprehensive forestry action plan by establishing an inventory of urban trees, determining a sustainable urban tree coverage, and allocating new resources to increase urban tree coverage in the City.

#### **Action:**

- **Undertake a tree inventory with community support to provide information for an Urban Forest Master Plan.**
- **Develop a comprehensive Urban Forest Management Plan with sustainable targets for the urban tree coverage in Hamilton.**
- **Create a Fund to preserve and enhance tree coverage in parks, open spaces, and forests in Hamilton.**

#### **A. e) Land-Use Planning – Adaptation & Mitigation**

Where different land uses, buildings and their amenities are located, and how they are laid out on the urban landscape is perhaps the most significant component to consider the influences on and impacts from climate change.

In the post World War II era, Canadian cities have been characterized by urban sprawl. Sprawl is associated with the expanding uptake of greenfield lands with each increment of a City's population growth developed. Home, work, shopping and recreation facilities are separated in this design leading to dependence on automobile transportation. The result is increased vehicle emissions that contribute to air pollution and negative impacts on human health. Low-density and segregated development patterns discourage alternative forms of transportation such as public transit, walking and bicycling. Public transit generally requires medium to high-

density diversity in land uses to foster travel for many purposes along the same route and more compact serviced districts to be cost-effective

Single-use, dispersed neighbourhoods, located far from downtowns, produce nearly 3 times more annual emissions per household than mixed-use, compact neighbourhoods near the downtown.

Within the same location, developing more compact neighborhoods with mixed-use and pedestrian oriented designs decreases greenhouse gas emissions by 24-50%.

*Canadian Mortgage and Housing Corporation*

According to the Ontario College of Family Physicians (2005), the best available evidence indicates that greenspace is an essential part of human health. People cannot continue to lead healthy lives without sufficient farmland to produce local food, forests to help purify the air, and protected watersheds to provide safe drinking water. Neither of these complementary goals - protecting environmental systems and protecting human health - can be accomplished, however, without curbing urban sprawl.

In Hamilton, the municipal planning is being altered to combat sprawl. The planning framework from growth management via the Growth Related Integrated Development Strategy (GRIDS), the Official Plan, secondary plans, site plan and design guidelines are being updated to prevent sprawl, change land use patterns and increase density. These initiatives will support and provide transit options and should contribute to a reduction of greenhouse gas emissions.

### **A. e. i) Growth Management**

The Growth Plan for the Greater Golden Horseshoe (Places to Grow) forecasts the City of Hamilton increasing by 150,000 people, 80,000 households and 90,000 jobs between 2001 - 2031.

GRIDS identified a broad land use structure, associated servicing infrastructure and economic development strategy to accommodate Hamilton's growth forecast.

The GRIDS growth priority is a nodes and corridors urban structure. Corridors are mixed uses areas that serve a main street 'spine' for higher density residential buildings, the retailing of goods and services, higher transit services, community and recreational uses. The nodes reflect existing higher density concentrations of live, work and play activities.

Of the 80,000 new dwelling units to be required by 2031, 58,400 units will be accommodated within the existing approved urban area providing a compact urban form with complete communities of modestly increased density and mixed uses that are more transit supportive. Employment areas are located in proximity to residential areas to reduce home/work trip distances. The need for additional greenfield land is significantly decreased over current trends. This limits the impact on natural heritage system (environmental lands) and agriculture and rural lands in the future expansion of the City.

### **A. e. ii) Intensification**

In order to achieve this growth scenario, increased residential intensification and greater levels of land use diversity within the existing urban boundary is required. Intensification includes:

- Redevelopment including the reuse of brownfield sites,
- Redevelopment of underutilized lots within previously developed areas,
- Infill development of vacant land, and
- The expansion or conversion of existing buildings

(Provincial Policy Statement, 2005)

Intensification will be strategically focused throughout the urban area in nodes, corridors and key sites. Increased density will provide the critical mass of people required to provide for higher order inter-regional transit system connections to Hamilton and facilitate the provision of an efficient local transit system.

### **A. e. iii) Protection of the Natural Heritage System**

In addition to minimizing the amount of land required through urban boundary expansion, the City is focusing on the protection and enhancement of the Natural Heritage System (Environmental lands). With the revised Provincial Policy Statement (2005) and the Greenbelt Plan (2005), the City is required and has the authority to protect more natural heritage features and functions in both the urban and rural areas of the City. As a result, significantly more environmental lands should be protected from development and protected from the impact of development on surrounding land. Protecting and enhancing natural areas serves to buffer and moderate extreme air and water related impacts associated with climate change.

### **A. e. iv) Community Design**

Future development and redevelopment of the City's neighbourhoods will be based on the concept of "complete communities". Most existing areas segregate land uses requiring people to drive to each destination. Complete communities mix residential land use, shopping, recreation, education and workplaces in a higher density that provides better support for people and the environment. Community design must ensure they are more convenient and liveable, pedestrian friendly and walkable. Residents and businesses who are less dependent on the automobile are more likely to participate in active transportation (e.g., walking, cycling).

Increased densities in combination with complete communities will provide alternatives to the automobile and result in a decrease of greenhouse gas emissions.

#### **Ontario Provincial Policy Statement (2005):**

The Ontario Provincial Policy Statement provides policy direction on matters of provincial interest related to land use planning and development. Air quality & climate change effects of planning decisions are two of the many factors that need to be evaluated in the decision-making planning process. Section 1.1.3.2 (a) (3) of the Statement makes specific mention of the importance of minimizing impacts to air quality, climate change and promoting energy efficiency.

### **A. e. v) Urban Design**

Recent changes to the Ontario Planning Act provide a City with the authority to regulate exterior design and require sustainable building forms. Promotion of development that is designed to be sustainable, supportive of public transit and oriented to pedestrians is deemed to be a provincial interest. The adherence to site plan guidelines will be a critical component of achieving sustainable design and contributing to the development of complete communities. The location, design and materials used in the construction of buildings are components of planning that can contribute to air issues and adaptation to climate change.

#### **A. e. vi) Community Improvement Plans**

Community Improvement Plans are a vehicle by which government funding programs can be established for specific areas of the City. However, these plans and associated funding and programs are limited to specific scopes (e.g., heritage or architectural significance, infrastructure issues, parking, business improvements areas) by the Ontario Planning Act. Recent amendments to the Ontario Planning Act permit grants and loans for energy efficiency in Community Improvement Plans.

The changes to the Building Code and the more energy efficient urban forms that will result from the Places to Grow initiative have large impacts on emissions over the long term, but they affect only new buildings and new neighbourhoods, and their greenhouse gas emission impacts will only begin to build by 2020.

*Ontario Government, 2007*

The City's Official Plan provides the background policy framework for land use, transportation and infrastructure planning across Hamilton. Since all three of these areas impact or are impacted by poor air quality and climate change, it is important to have air quality and climate change issues considered and inform policy direction of the new Official Plan.

#### **Action:**

**Throughout the development of the urban component of the new Official Plan:**

- **Implement the approved land use planning related growth strategy (GRIDS and the recommendations of the associated Master Plans).**
- **Provide for complete communities and mixed use and related urban design guidelines.**
- **Target areas for residential intensification.**
- **Develop policies for the protection and enhancement of the Natural Heritage System.**
- **Examine and incorporate air quality and climate change policies in the City's Official Plan.**
- **Examine the ability to prepare Community Improvement Plans for energy efficiency.**

#### **A. f) Built Environment - Adaptation & Mitigation**

The built environment (buildings and city infrastructures) influence, and are influenced by, the local climate and can be impacted by climate change. Buildings and construction generate air pollutants and greenhouse gas emissions through the energy use of fossil fuels. Buildings and associated infrastructure reflect heat thereby warming the local climate and inducing smog. Buildings are also impacted by changes in climate such as extreme weathering.

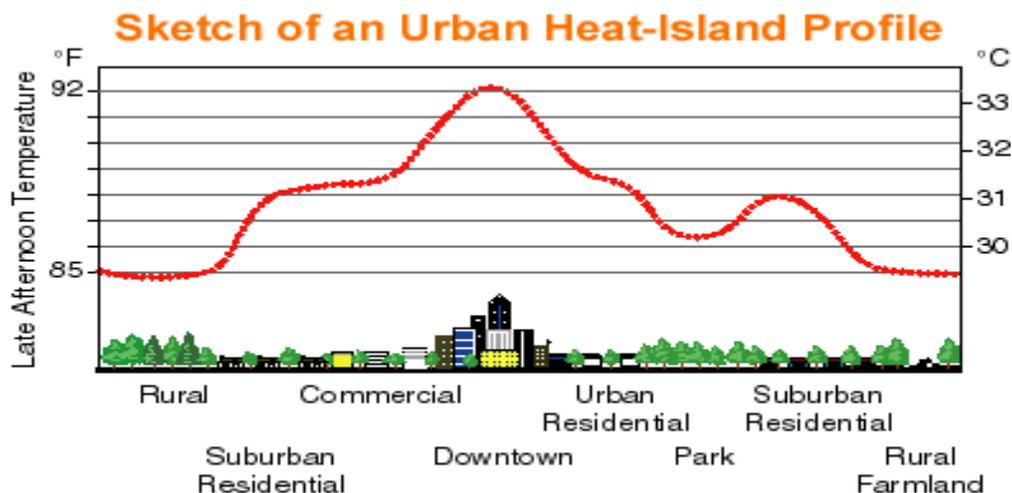
Buildings and their construction account for 25% of Canada's overall greenhouse gases emitted through new construction, combustion of fossil fuels to meet building utility requirements and electrical consumption in lighting and air conditioning. Most emissions come from the combustion of fossil fuels to provide heating, cooling, and lighting and to run electrical equipment and appliances after the building is constructed. The manufacture of building materials and products, and emissions from transportation sources generated by urban sprawl, also contribute significant greenhouse gas emissions every year.

Greenhouse gas emissions from new buildings can be reduced through improved energy efficiency in building design and construction that reduce the use of fossil fuels. Existing buildings can be retrofitted to increase energy and water efficiency, although retrofitting may be more costly when compared to a more proactive approach to the design and development phase of buildings, existing buildings still need to be addressed to reduce their energy demand and greenhouse gas emissions. Many energy-efficiency investments in new buildings have a pay-back period of as little as 3-5 years.<sup>10</sup>

Cities can be up to 4 to 7 degrees Celsius hotter than their suburban or rural surroundings on hot summer days. This is referred to as "the heat island effect" and occurs because urban development replaces trees and natural surfaces with large amounts of paved and dark asphalt coloured surfaces like roofs, walls, roads, and parking lots that absorb, rather than reflect, the sun's heat. The vertical surfaces of larger buildings, with concrete walls and glass absorb great amounts of incoming radiation and store heat. Tall buildings within many urban areas also provide multiple surfaces for the reflection and absorption of sunlight, increasing the heat levels in urban streets and neighbourhoods (called the "canyon effect").

The absorption of heat by urban developments and buildings causes air temperatures to rise. Hotter air in cities increases both the frequency and intensity of ground-level ozone, smog and intensifies heat waves in cities, making citizens at increased risk for heat exhaustion and heat stroke (ICLEI, 2005). Waste heat from cars, factories and air conditioning used to cool buildings can add more heat through the use of energy so the elevated temperatures build up over an entire city (**Figure 2**).

**Figure 2: The Urban Heat Island**



<sup>10</sup> Natural Resources Canada, Office of Energy Efficiency <http://oe.nrcan.gc.ca/>

Heat Island Reduction strategies (i.e. shade trees, reflective or white roofs, greenroofs, less reflective pavements and urban reforestation) can reduce cooling energy use in buildings, lower the ambient air temperature and improve local air quality. For example, green rooftops can reduce the impacts of the heat island effect in cities: a study conducted at Ryerson University in 2005 demonstrated that using green roof technology for 8% of Toronto buildings reduced the city's heat island effect by up to two degrees Celsius. White roofs are an affordable interim measure, but green roofs would provide long term benefits such as reducing air pollutants through absorption by plants, provide further shade and insulation to lower energy costs, and reduce urban water runoff. The Ryerson study found that green roofs could slow runoff of rainfall at peak times, reducing the risk of sewer overflows<sup>11</sup>.

Climate change may lead to potential increases in the amounts of precipitation as well as the frequency of extreme weather events, including storms. Thus it is also likely that there will be an increased rate of weathering on the built environment. Damage to buildings from weather can be caused by: storm damage; rain penetration; poor durability of construction materials; flood damage; coastal erosion and foundation movement. To respond to these anticipated changes, new buildings should compensate for changing weather in their design, materials and construction processes.

Building service retrofits such as solar panel and roof garden installations increase energy efficiency, improve thermal comfort, and saves peak demand electricity which generates savings on heating and electricity bills. They also contribute to reduced stormwater runoff and improved air and water quality. Strategically placed trees, shading windows and walls of a building, reduce the amount of direct heat gain. Trees act as filters, trapping dust particles and absorbing gaseous pollutants.

A number of green building standards<sup>12</sup> have emerged that address the energy use and greenhouse gas emissions from the development, construction and use of buildings. The Leadership in Energy & Environmental Design (LEEDS) is one of these standards.

#### **A. f. i) LEED – Leadership in Energy & Environmental Design**

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a voluntary standard created by the US Green Buildings Council. It is a US and Canadian accepted benchmark for the design, construction, and operation of high performance buildings. LEED gives building owners and operators the incentive they need to have an immediate and measurable impact on their buildings' performance. In Canada, the Canadian Green Building Council introduced Canadian standards for LEEDs.

The LEED system is a rating system that provides points for building features that fall into six categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Air Quality, and Innovation and Design Process.

LEED has certain prerequisites that must be met for certification, along with numerous optional credits for each category, which earn the building additional points. The number of points a building earns determines its LEED rating: LEED Certification, LEED Silver, LEED Gold, and LEED Platinum.

---

<sup>11</sup> Geoff Wilson. *Urban Design Forum*, 76

<sup>12</sup> LEED (Leadership in Energy and Environment Design), Green Globes, R – 2000, Energy Star, and EnerGuide for Houses are some of the standards in Ontario.

The Corporation's first LEED building is the Hamilton Water & Wastewater Division's Woodward Environmental Laboratory and Operations Control Centre.

In, 2006 East Gwillimbury adopted a Municipal policy directing all new Town facilities and new industrial, commercial, institutional and high-rise residential buildings within the municipality to be built to LEED "Silver". This same policy also requires all major renovation projects for industrial, commercial, institutional and high rise residential buildings to meet LEED "Silver" after January, 2010.

Under the Corporate Energy Policy (PW Report 07-014), the Corporation will be undertaking a LEED Pilot program over a 3 year period.

#### **A. f. ii) Green Development Standards**

The City of Toronto adopted the level of LEED Silver as an interim standard for its new buildings. However, Toronto has examined the creation of locally driven, green development standards. In 2006, the City of Toronto adopted green development standards through the enhanced targets for site and building design that address matters of sustainability. The City of Toronto proposed an integrated set of principles and practices to guide the development of City-owned facilities and to encourage green development amongst the private sector.

Toronto sees the development of more sustainable buildings and sites could use less electricity and water, more use of modes of transportation that do not burn fossil fuels, improve management of stormwater for better water quality, less waste production, and create green spaces that are aesthetic and provide habitat for local fauna. Green development standards identify the criteria for development that fulfill these objectives.

Massachusetts will soon require private developers to estimate the greenhouse gases that large-scale projects will produce and reduce them with measures such as energy-efficient lighting, alternative fuels, or commuter shuttles. Planning projects (public, large private and environmentally sensitive) that warrant a state environmental review will have to assess how the projects contribute to global warming. Large housing developments, office projects, and mixed-use developments that combine retail, industrial, and residential uses will be affected. This makes Massachusetts one of the first states to consider greenhouse gases as part of developers' environmental impact reviews (Boston Globe, 2007).

#### **Action:**

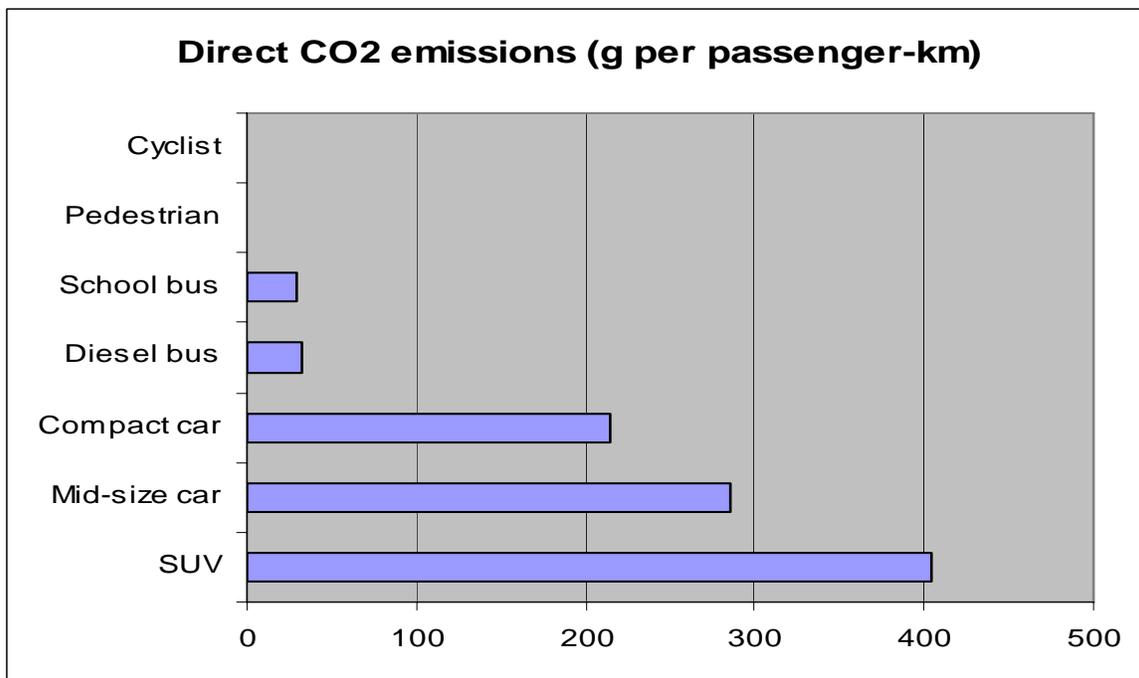
- **Encourage energy retrofits, especially in low income neighbourhoods and housing.**
- **Show leadership for green retrofits through the incorporation of energy efficiency, waste management, water efficiency and low greenhouse gas emissions in the retrofitting of Hamilton City Hall.**
- **Study the feasibility of green and white roofs in the downtown of Hamilton (combat urban heat island).**
- **Explore green development standards (LEED, Energy STAR) for public and private developments and have City staff become LEED Accredited professionals.**
- **Research climate adaptation strategies for buildings and city infrastructure.**

#### **A. g) Transportation and Transportation Planning - Mitigation**

Transportation (i.e. automobiles, trucks, buses, commercial vehicles) is the largest source of greenhouse gas emissions in Canada, and is the leading source of NO<sub>x</sub> emissions within the City of Hamilton. Transportation emissions have a major impact on local air quality and creating greenhouse gases associated with climate change. A more inclusive approach to thinking about emissions from the transportation sector would include support activities such as oil refining, industries used in the manufacturing of vehicles and the production of steel and concrete required in the construction of roads and bridges. Including these indirect emissions to transportation's direct tail pipe emissions plus the vehicle's air condition units (which may leak HFC's) increases the amount of energy-related greenhouse gas emissions for transportation to about 50%.

This is why providing and linking transportation corridors that encourage citizens to use alternative and multiple modes of transportation outside of the personal automobile supports liveable sustainable communities.

**Figure 3: Greenhouse Gas emissions by Vehicle type**



Over the past two decades, the City of Hamilton has seen a significant increase in the use of automobiles with corresponding decreases in the percentage share of transit usage. Between 1986 and 2001, local transit went from a 12% morning peak period trips down to 6%. Increases in the use of automobiles now accounts for 85% of daily trips. Encouraging numbers show that over 10% of citizens walk or cycle in the morning peak period (Transportation Master Plan, 2007).

**Figure 4: Trends in Mode Shares of Trips in Hamilton**

AM Peak Period						
Year	Auto Driver	Auto Passenger	Local Transit	GO Rail	Walk and Cycle	Other
1986	63%	11%	12%	0%	11%	4%
1996	63%	13%	7%	1%	12%	5%
2001	64%	12%	6%	1%	11%	6%
24 hours						
Year	Auto Driver	Auto Passenger	Local Transit	GO Rail	Walk and Cycle	Other
1986	63%	18%	10%	0%	7%	2%
1996	66%	18%	6%	0%	7%	3%
2001	68%	17%	5%	1%	6%	3%

Source: Transportation Tomorrow Survey, 2001, 1996 and 1986 Travel Survey Summaries for the Greater Toronto Area, prepared by the Data Management Group, University of Toronto Joint Program in Transportation, February 2003.

A common situation among mid-sized cities like Hamilton that are not challenged by road congestion or constrained parking is that little progress is made towards promoting viable alternative modes of transportation (transit, pedestrian, cycling). Encouraging compact mixed land-use, presents an opportunity for cities to promote transportation demand management, increase transit, and alternative active transportation (walking and biking) means to reduce future congestion problems and reduce climate change impacts while controlling air pollutants.

In 2007, the City completed the Transportation Master Plan which includes operational policies for Hamilton's transportation network over the next 30 years in line with the preferred growth management option of GRIDS.

**Figure 5: Transportation targets under the Transportation Master Plan**

	Current Situation (based on 2001 data)	Potential Near Term Scenario (based on a goal of reducing auto vehicle-kilometres by 10% compared to 2001)	Potential Long Term Scenario (based on a goal of reducing auto vehicle-kilometres by 20% compared to 2001)
Estimated daily vehicle kilometres of travel by Hamilton residents	4.8 million km	4.3 million km	3.8 million km
Share of daily trips made by single-occupant drivers	68%	58%	52%
Share of daily trips made by using municipal transit	5%	9%	12%
Share of daily trips made by walking or cycling	6%	10%	15%
Annual transit rides per capita (City-wide) <sup>(1)</sup>	40	60	80-100

<sup>(1)</sup> Based on total residents within City boundaries, including residents outside primary service areas. Excludes GO Transit ridership.

The objectives of the Transportation Master Plan included offering a choice of travel modes, emphasizing walking and cycling, public transit and carpooling, encourage a more compact urban form, intensification and transit-supportive node and corridor development, minimizing

impacts on air, water, land and natural resources, enhance the liveability of neighbourhoods and rural areas, and operate transit and road systems efficiently, and be affordable to the City.

The preferred strategy in Hamilton is increased public transit with emphasis on options for cycling and walking, the reduction of single occupant vehicles through travel demand management, and optimizing current road capacity before major road expansion.

Key elements of the plan include:

- Establishment of a Rapid Transit system with three primary spines and interconnecting routes.
- Construction of 120 km of new on-street bike lanes and over 140km of multi-use paths.
- Supporting integrated travel through bike racks on buses, construction of new bicycle facilities, and encouraging “walkable” streetscapes.
- Potential incline railway near Wentworth Street to reduce the effect of the escarpment for cyclists and pedestrians.
- Encouraging alternative modes of transportation through Transportation Demand Management.

In June 2007, the Province of Ontario announced their MoveOntario 2020 plan which is aimed at improving public transit in the Greater Toronto and Hamilton Area (GTHA) through the funding of 52 projects, including two projects in Hamilton:

- Rapid transit along the King/Main Corridor, between Eastgate Square and McMaster University; and
- Rapid transit along the James/Upper James Corridor between King Street and Rymal Road.

Following the announcement, Metrolinx was charged with implementing a number of “Quick Win” projects that would have an immediate impact on providing sustainable transportation options within the municipalities of the GTHA, including three specific transit projects in Hamilton as well as a general GTHA bicycle promotion initiatives project. These projects include:

- 6 articulated hybrid buses for the James/Upper James corridor. This project will increase service levels on the Downtown-GO terminal - Mohawk College - Airport route by 2009, as a precursor to future rapid transit improvements on Upper James Street.
- 12 new hybrid articulated buses, and for customer waiting areas for the BLine between McMaster University and Eastgate Square. This project will result in more frequent service, more capacity, and more comfort provided by a dedicated fleet of high-tech, hybrid articulated buses.
- A GO/VIA platform at James Street North. Works would include a new platform, passenger amenities and park-and-ride lot. This would offer Hamiltonians more choice in travel modes and more convenient access to GO and VIA inter-regional train networks, and would enable two-way rail commuting potential.
- Metrolinx also approved the establishment of a GTHA-wide program for the implementation of Bicycle Promotion Initiatives for the provision of safe and secure bike storage and the expansion of the bike/bus rack program called BikeLinX. The goal of BikeLinX is to enhance the links between active transportation and public transit. In

March 2008, the City of Hamilton was presented with funds to be used to purchase and install bicycle racks on buses and provide secure and safe bicycle parking.

### **A. g. i) Personal Transportation Options - Biking**

The Transportation Master Plan recognizes the importance of non-motorized forms of transportation (cycling and walking) as viable alternatives to personal vehicles. The existing bicycle lanes are fragmented and that the basic network needs construction of 120 km of new on-street bike lanes. Networking should be enhanced with supportive infrastructure such as secure bike parking, linking cycling with transit through use of bike racks on buses, and zoning and site plan provisions to ensure land uses encourage transit, bicycling and pedestrian linkages.

Shifting Gears- A New Cycling Plan for Hamilton- Wentworth was adopted by Regional Council in 1999. It provided guidance to installing new or updating existing cycling facilities. The Plan focused mainly on the urban centres within the City with less emphasis on outlying regions. An Alternative Transportation Coordinator position has been created to assist the cycling, pedestrian, and “walkability” programs of the City, and to update Shifting Gears<sup>13</sup>.

### **A. g. ii) Transportation Demand Management - Mitigation**

Transportation Demand Management (TDM) aims to optimise the capacity of current transportation systems. It encourages individuals to:

- Choose more sustainable forms of transportation and reduce single occupant vehicle trips
- Using alternative travel modes (e.g., walking, cycling, taking public transit or carpooling) that consume fewer resources and create fewer undesirable impacts.
- Travel outside peak hours to avoid congestion.
- Choosing closer destinations or combine several stops into one trip.
- Use telework or other communication options where practical.

TDM can help reduce congestion, defer the need for new infrastructure, and improve air quality. The City of Hamilton has been active in the Smart Commute Association which implemented a number of TDM measures. The Smart Commute Association is a partnership between municipal governments and interested business and other organizations that support these initiatives for implementing TDM measures.

The Smart Commute Association (SCA) has been responsible for creating a Transportation Management Association (TMA) Toolkit which can help municipalities develop and maintain sustainable transportation initiatives through Transportation Demand Management. The Carpool Zone Website ([www.carpoolzone.ca](http://www.carpoolzone.ca)). The website offers a Map-based trip editor, Match ratings and new match indicator, Multi-trip match mapping, Route-based matching, and carpool names. The website has recruited 16 new employers throughout the GTA and Hamilton, with over 3500 users forming 230 carpools. The Carpool Zone Website alone has resulted in 78 tonnes of verified greenhouse gas emission reductions, and over 300 tonnes of estimated emission reductions.

Since January 1, 2008, The Smart Commute program, known for its online carpooling website and other Transportation Demand Management commuter services, has been recruited by

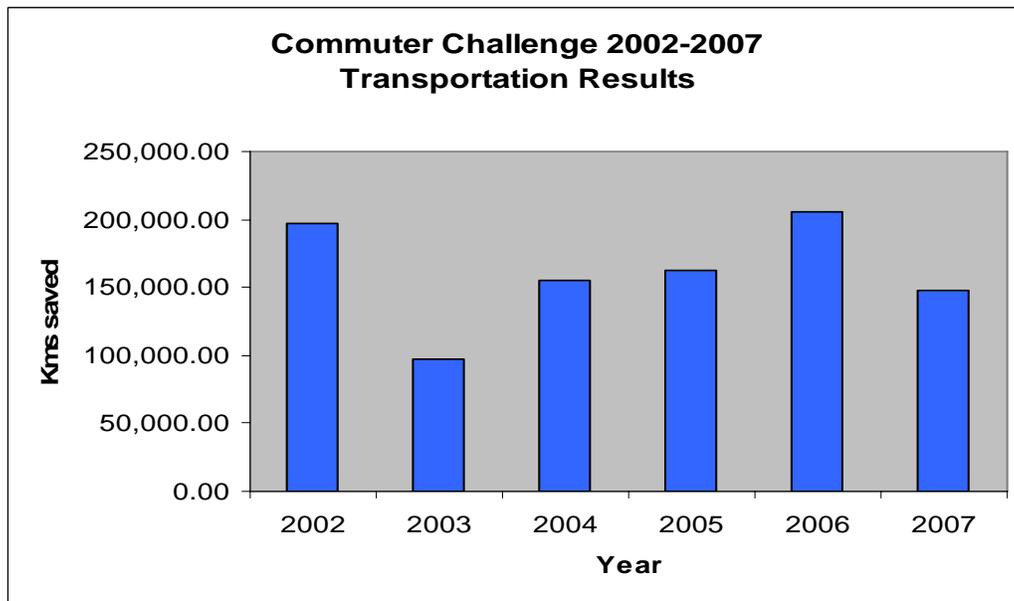
---

<sup>13</sup> City of Hamilton Public Works Department, *On-Street Cycling Program* (PW07078), May 2007.

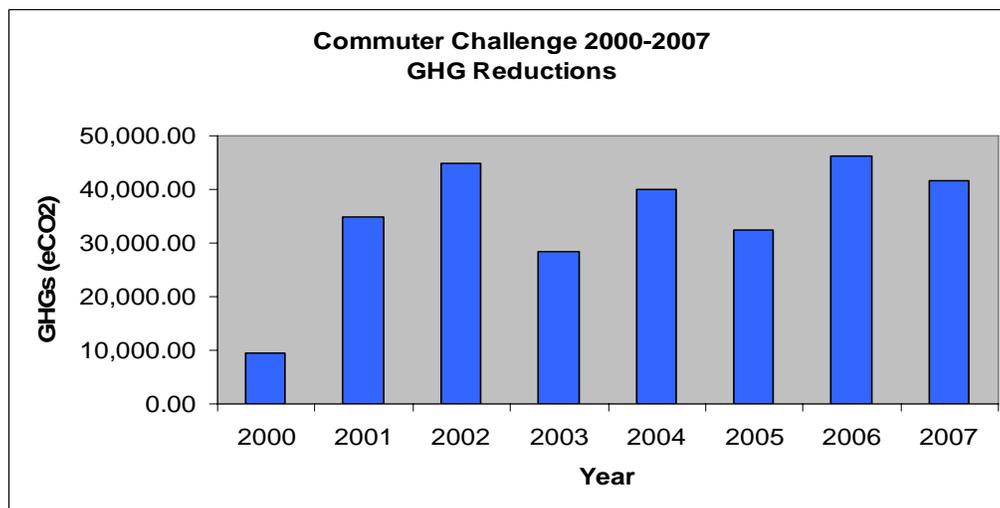
Metrolinx of the provincial government. The Smart Commute Association will compliment the Metrolinx by continuing to work with local employers to improve commuter options like carpooling and transit as well many more Transportation Demand Management Initiatives. Metrolinx and Greater Toronto and Hamilton Area (GTHA) municipalities will work together to make the region's transportation system greener and more sustainable.

Since 2000, the City has participated in the Commuter Challenge. The Commuter Challenge is a week-long, friendly competition between Canadian cities to reduce emissions by encouraging citizens to use sustainable modes of transportation. The goal of the program is to reduce the number of single occupancy vehicles (SOVs) traveling on roads. **Figures 6&7** below show the reduction in distance traveled by single occupancy vehicles and corresponding reductions in greenhouse gases over the week long event.

**Figure 6: Reduction in travel distance by single occupancy vehicles**



**Figure 7: Reduction in Greenhouse Gas Emissions due to the Commuter Challenge**



The Public Health Department has supported of the Active & Safe Routes to School program. A national program that promotes the use of efficient transportation for daily trips to school,

addressing health and traffic safety issues while taking action on air pollution and climate change.

The Corporation offers eligible employees a discounted bus pass. The Employee Commuter Pass program is available to full time employees who do not have an employer paid parking and operates through a flexible payroll deduction. The program is consistent with the objectives of the Downtown Transportation Plan and encourages the use of transit. In addition, an employee car pool sharing website is available to City employees via the Enet which encourages employees to ride share.

**Action:**

- **Demonstrate commitment to Transportation Demand Management through leadership by expanding the number of employees using alternative travel services (car pooling, car sharing, secure bike parking, and change facilities at office, use of transit, flexible work time, and teleworking).**
- **Maintain a Transportation Demand Management position to promote alternative modes of transportation (pedestrian, cycling, transit) to City residents.**
- **Continue supporting the annual Commuter Challenge and other programs to promote alternative modes of transportation.**

**A. g. iii) Greening the Corporate Fleet - Mitigation**

Hamilton's Green Fleet Implementation Plan was approved in 2005 to reinforce its commitment to improving air quality and preventing climate change. The objective is to have one of the country's leading low-emission fleets.

In 2007, the City of Hamilton received a silver rating for fleet excellence under the E3 Fleet Program. The E3 "Environment, Energy and Excellence" Fleet Program is a Canadian wide program that assists fleets in meeting green standards. Fleets are rated and audited by a third party in the areas of fleet action plan, training and awareness, idling reduction, vehicle purchasing, fuel management, operations and maintenance, trip and route planning, fuel efficiency and greenhouse gas performance. Ratings range from Bronze, Silver, Gold and Platinum.

The Corporation's Central Fleet consists of approximately 825 licensed vehicles and almost 400 units of specialized equipment. Vehicles operated by the Transit Division, Hamilton Police Services, and Emergency Services have separate management. As part of the Green Fleet Implementation Plan, Hamilton has replaced 60 older sedans and pickups with hybrid electric vehicles (HEVs) and introduced renewable fuels, for the City's diesel fleet in 2007. This is projected to reduce carbon dioxide output by 2,300 to 3,300 tonnes over three years and reduce air pollutants by over 50 per cent. In fact, from 2005 to 2006 Hamilton increased fuel efficiency by 5% for every kilometre travelled and decreased GHG emissions by 2% by kilometre (Fraser Basin Council, 2007).

**Reduced fuel consumption**

- Hybrids overall average 25 per cent lower fuel consumption
- Hybrid cars and utility vehicles are 50 per cent more fuel efficient
- Hybrid pickup trucks are about 10 per cent more fuel efficient

**Table 2: Summary of Green Fleet Implementation Plan eCO<sub>2</sub> Projected Reductions 2006 – 2008**

HEVs	395,600 kg
Biodiesel (Soy)	1,942,500 kg
Biodiesel (Animal Fat)	2,971,500 kg
Total (depending on the feedstock of biodiesel)	2,338,100 – 3,367,100 kg

*Note – eCO<sub>2</sub> reductions from biodiesel are based on a life-cycle analysis and not tailpipe emissions.*

Fugitive dusts, including road dusts, are a significant local source of particulate in Hamilton’s airshed. Road dusts can also contain elevated levels of toxic substances such as chromium, manganese and polycyclic aromatic hydrocarbons (PAHs).

Regular street sweeping of roadways and streets can reduce the impacts of dust along and near roadways. The effectiveness of the sweeping equipment, the technology used in the sweeper and the frequency of sweeping have a direct influence on the dust collected. The more efficient the collection of material, particularly the finer fractions, the less will be available for dispersion into the air due to traffic.

To deal more effectively with fine particulate pollution, Hamilton has replaced all 17 street sweepers with new regenerative-air sweepers. This is based on a major change in sweeper design in North America as the City sweepers obtained the highest performance in removing particulate matter.

**Action:**

- **Continue to green the corporate fleet through the investigation and incorporation of hybrid and new vehicle technologies, right sizing and alternative fuels.**
- **Demonstrate new and proven transportation technologies in fleets that lower GHG emissions and improve local air quality.**
- **Examine site plan approval standards for heavy industrial uses to reduce the formation and track-out of road dust from unpaved sites.**

**A. g. iv) Transit - Mitigation**

Public transit includes services to the general public in multi-occupant vehicles ranging from shared taxis and vans to buses. Public transit solves a number of transportation management issues including: road and parking costs, congestion, energy consumption and pollution emissions, mobility for non-drivers, and costs to consumers.

- One full bus takes 40 vehicles off the road. Over the course of a year, that full bus will prevent 9 tonnes of pollutants from getting into the atmosphere.
- Using public transit for one year instead of your car will save nearly a tonne of pollutants from being released into the atmosphere.

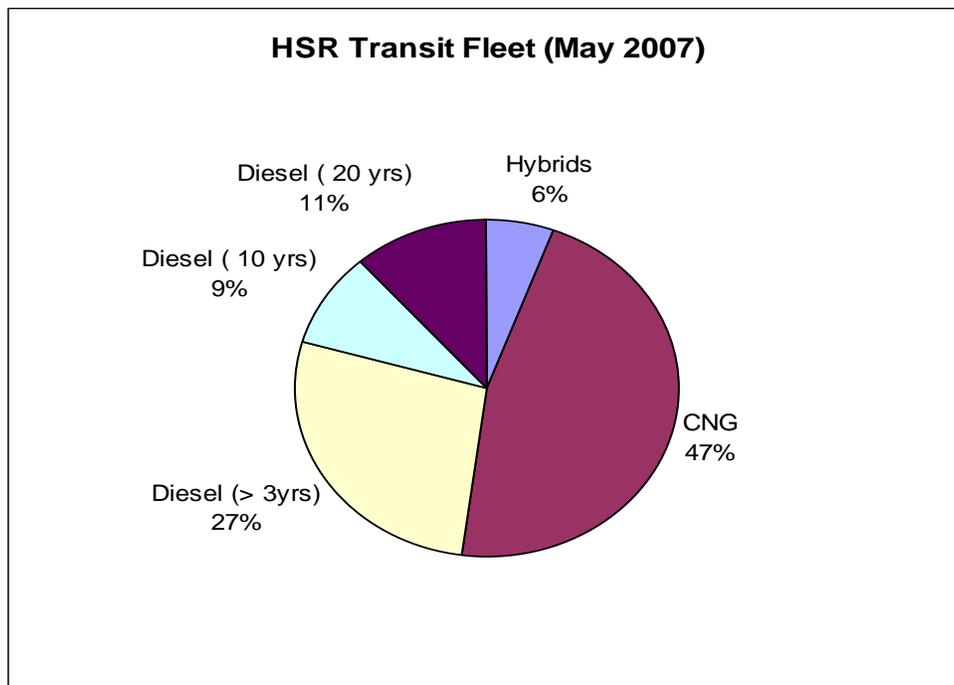
Transit becomes more important as cities grow. In smaller cities, transit primarily serves disadvantaged riders (people cannot use an automobile), representing 5-10% of the population. As cities grow in size and density transit serves more riders (people who have the option of driving), and provides more benefits by reducing traffic and supporting efficient land use (Victoria Transit Policy Institute, 2006).

The Hamilton Street Railway Company (HSR) provides transit service in Hamilton’s urban area. Transit services outside of downtown Hamilton are currently limited. HSR provides about 1.55 annual vehicle hours per capita, generating about 47 annual rides per capita. The HSR has approximately 200 buses in their fleet and, in addition operates para-transit services (DARTS) for seniors and disabled persons using vans and contracted taxi service where appropriate.

The Transportation Master Plan (2007) commits to the establishment of a Bus Rapid Transit (BRT) Network. The BRT will be supported by land use policies that encourage more compact and mixed-use development around transit nodes and corridors. A BRT system can be phased in over time using existing east-west and north-south corridors, with a longer term vision of dedicated bus lanes, extended hours of operation, low to zero emission fleets and enhanced passenger information systems.

The MoveOntario 2020 announcement permits Hamilton to accelerate rapid transit planning beyond the considerations in the Transportation Master Plan, and to consider the use of Light Rail Transit in the short term, instead of starting with Bus Rapid Transit and moving to Light Rail Transit in the longer term. Public consultation is being held with regards to the Rapid Transit feasibility Study to receive comments on the options for Bus Rapid Transit and/or Light Rail Transit.

HSR has implemented a number of initiatives to “green” public transit operations. HSR was one of the first transit authorities to introduce natural gas buses into their fleet. It has also purchased 12 new diesel-electric hybrid buses which contribute to improving Hamilton’s air quality and reducing greenhouse gases. HSR will also explore the use of biodiesel in buses in the future.



Hybrid diesel-electric buses consume less fuel than the conventional diesel bus. In urban applications, fuel savings can vary between 25 and 40%. For example, New York City Transit found a hybrid diesel-electric bus traveled 3.27 miles per gallon, compared to 2.31 miles per

gallon experienced by the conventional diesel buses (a savings of 41%) (Canadian Urban Transit Association, 2007).

According to the Canadian Urban Transit Association, emissions savings by Hybrid diesel-electric buses include:

- 50% reduction in nitrogen oxide
- 90% reduction in particulate matter
- 90% reduction in carbon monoxide
- 90% reduction in hydrocarbons, and
- Carbon dioxide is reduced in direct proportion to the amount of fuel used

Natural gas is a clean burning alternative to traditional diesel in buses. Exhaust from natural gas powered vehicles (NGV) and compact natural gas (CNGs) are lower - per unit of energy, natural gas contains less carbon than other fossil fuels, and thus produces lower CO<sub>2</sub> emissions per kilometre. Methane emissions (compact natural gas is approximately 90% methane) is also a significant factor for CNG in that methane remains in the atmosphere for 9-15 years and traps over 20 times more heat than an equivalent amount of carbon dioxide. In Ontario, transit agencies have not renewed their CNG programs mainly due to poor performance and high costs. Most are opting for low diesel emission buses.

HSR is also connecting transportation modes and trip planning for users through the on-line HSR trip planning website, the use of shared-ride taxi services in portions of Glanbrook and Stoney Creek, and bicycle racks on the buses to encourage cycling and transit within the City.

Provincial program announcements such as the MoveOntario2020 promise, a multi-year \$17.5 billion rapid transit action plan for the Greater Toronto Area and Hamilton, and a new transit fare card system will support and increase transit ridership.

**Action:**

- **Increase the use of public transit as a viable transportation mode within the City by increasing transit services in the future and setting a goal of increasing transit funding each year.**
- **Continue greening the transit fleet through the purchasing of low to zero emission vehicles to replace older vehicles coming out of service.**

**A. g. v) Idling Control - Mitigation**

Unnecessary idling results in Canadians wasting over 3.2 million litres of fuel a day. This costs about \$1.9 million and produces over 7.6 million kilograms of greenhouse gases, based on 10 minutes of idling per day. A freight-hauling truck averages 6 hours of idling a day for 43 weeks of the year. This means that a single truck emits about 21, 000 pounds of carbon dioxide, 390 pounds of carbon monoxide and 225 pounds of nitrogen oxides per year.

*Natural Resources Canada, 2006*

As part of the Green Fleet Implementation Plan, the Corporation established a policy on the idling of corporate vehicles that limits idling to no more than 3 minutes consecutively.

In 2006, Green Venture launched the Idling Stinks Hamilton campaign to promote awareness on vehicle idling in the community, at schools and in private fleets. Since the education campaign began, approximately 90 Idling Posters have been distributed to libraries, community centres, community policing centres, City of Hamilton municipal service centres, and Hamilton's Emergency Medical Services (EMS) stations, 204 idling signs are up at schools, Day cares, City Hall, driving centers, retirement and nursing homes and small auto businesses, and 500 idling stickers on 500 City of Hamilton Fleet vehicles.

In 2007, the City passed an Idling Control By-law and will continue to work with partners to educate citizens to stop idling their vehicles, protect public health, improve local air quality and reduce greenhouse gas emissions.

**Action:**

- **Continue to educate individuals on idling and associated impacts on health, air quality, climate change and vehicle operation costs.**

**A. h) Energy Conservation & Demand Management - Mitigation**

Energy production and use of non-renewable fuels – oil, natural gas, coal, is the largest significant source of greenhouse gas, smog forming pollutants, and acid rain. Gasoline and diesel burnt in cars and trucks; natural gas and other fuels used to heat and cool buildings; oil and gas that industry burns to drive production; boiler plants; and electricity generation all produce significant air pollutants and greenhouse gas emissions.

Emissions can be reduced simply from the promotion of energy conservation and demand management initiatives.

**Conservation behaviour** – Conservation occurs when customers change their behaviour to reduce the amount of energy consumed over time using technology already in place (e.g., by manually raising the temperature of their air conditioner by a few degrees).

**Energy efficiency** – Energy efficiency occurs when customers reduce their energy consumption but retain at least the same level of end-use service. Energy efficiency is the gain from investing in better appliances, equipment and buildings (e.g., replacing household electric appliances such as a refrigerator or air conditioner with higher efficiency models).

**Demand management** - Demand management occurs when customers reduce their electricity demand during peak-use hours (peak clipping) or shift some of their demand to off-peak hours (load shifting). Demand management can occur in a number of ways. For example, when residential customers shift the use of their dishwasher and laundry appliances to off-peak hours, when certain industrial customers contractually agree to shut down an assembly line in response to an automatic signal, and when customers allow the temperature on their thermostat to be increased in the summer by a previously installed device are all examples of demand management.

*Ontario Power Authority, 2007*

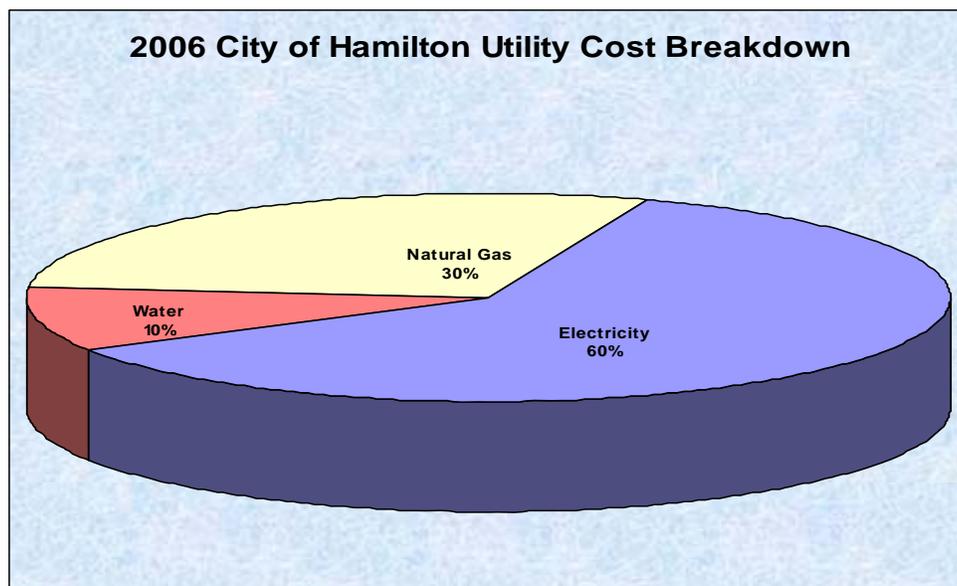
Increasing the use of alternative energy (i.e. wind, hydro, solar) in the supply mix will lower the demand for non-renewable sources and improve air quality and reduce greenhouse gases. A number of cities such as Toronto, Hamilton, Chicago, Seattle, Calgary, Ottawa, and Vancouver have implemented renewable energy sources or are exploring options. The Province has begun to provide incentives to promote alternative energy sources.

City buildings and the corporate fleet are the largest users of corporate energy. Other sources include office equipment (computer and photocopiers/faxes usage), street lighting, and operational equipment used in maintenance of green spaces and infrastructure (water & wastewater, lighting of roads).

The Corporation has already begun to address the corporate fleet energy usage through Hamilton's Green Fleet Implementation Plan.

To reduce the amount of energy that City buildings require (cooling, heating, and lighting), the Corporation has had an energy management program since 2006. The focus is on providing energy efficient upgrades to facilities while reducing operating costs, improving indoor air quality, addressing building code compliance, reducing energy consumption and reducing environmental emissions.

An energy management feasibility study of 20 City facilities (Arenas, Recreation Centres, Libraries, Fire stations, Public Works Operation Centers Social Housing, and Municipal centres) was undertaken and improvements were put into place by an energy retrofitting project.<sup>14</sup> This reduces carbon dioxide emissions by approx. 1,000 tonnes per year, which is the equivalent to removing 157 mid sized cars from the road.



In 2006, the Corporation created an Office of Energy Initiatives (OEI) to formalize and centralize responsibility for energy management in the City by focusing on how and where the

<sup>14</sup> City of Hamilton (2006) *Energy Retrofit Pilot Program: Implementation Phase (PW06078/FCS06067)*. Public Works, Infrastructure & Environment Committee- June 2006.

City of Hamilton is spending money on energy and to look for ways to save and reduce energy consumption. The role of the Office includes:

- Develop and implement billing verification strategies;
- Develop purchasing strategies and practices for commodities (natural gas, electricity and eventually fuel (diesel, unleaded, and biodiesel));
- Develop and project manage energy retrofit projects; and
- Raise awareness in the Corporation with respect to energy use.

The City of Hamilton has already seen nearly \$5 million in energy cost savings and avoided costs since implementing the Office of Energy Initiatives.

The City of Hamilton held an Energy Conservation Day in October 2006, to promote energy awareness. The Office of Energy Initiatives in the Public Works Department handed out approx. 2200 energy savings kits to residences and city employees. The kits, supplied by Union Gas and Horizon Utilities, included two low-flow shower heads, bathroom and kitchen aerators, an LED nightlight, two 13-Watt CFL Bulbs and conservation tips handbooks.

The City of Hamilton through the Voluntary Blackout Day in August 2007 reduced energy consumption by 2.2 per cent (104,737 kWh) and peak demand by 3.2 percent between the hours of 12:00 p.m. and 8:00 p.m. That is the equivalent of 6,000 homes turning off their air conditioners for 8 hours and taking 4,000 homes off the grid.

In March 2008, the City participated in its first Earth Hour, an initiative to raise awareness of climate change by switching lights off for an hour.

#### **Corporate Energy Reduction Targets**

Reduce energy intensity by 3% by 2009, 7.5% by 2012 and 20% by 2020, using 2005 as the base year.

*Corporate Energy Policy (2007)*

In 2007, the City approved the Corporate Energy Policy for City facilities and operations. Under the policy, the Corporation is addressing a number of initiatives to address energy conservation, efficiency and energy demand management in City buildings including:

- Establishing minimum or maximum temperature settings during business hours for the heating and cooling season for all City owned office space. That during the cooling season office space temperature shall not be set below 24 degrees Celsius (or 76°F). That during heating season that office space temperature shall not be set above 21 degrees Celsius (or 70°F).
- During summer smog days or emergency supply days, that cooling season temperatures be increased by up to 2 degrees Celsius to help reduce electricity requirements, air pollutants, and relieving electricity system supply constraints.
- Phase in lighting control upgrades to ensure that City facilities have the capability of turning off lighting in City owned facilities after hours when the buildings are unoccupied
- The replacement and elimination of incandescent lighting by 2010.
- City Purchasing Policies be adapted to designate supply of energy efficient equipment as the preferred option such as Energy Star rated appliances, photo copiers and computers. That all motor replacements be with high efficiency motors, which the minimum standards will be recommended by the Office of Energy Initiatives.

- All new back-up generation equipment be reviewed for conversion to cleaner fuels such as natural gas or dual fuel generation units verse diesel powered units.

The Corporation has a Computer Equipment Shutdown Policy for the daily shutting down of computers and related devices such as printers. The guidelines promote best practices to reduce energy consumption, reduce equipment wear and, time loss on corporate computer systems.

The City approved the conversion of traffic lights from incandescent bulbs to light-emitting diodes (LEDS). Intersections equipped with LED signals use approximately 30% of the energy used by intersections with traditional incandescent traffic signals. In Hamilton's case, the savings in electrical energy would amount to about \$350,000 per year in 2006. The energy savings equate to the amount used by about 500 average homes. In total, over 13,000 individual signal sections at 441 intersections have been retrofitted or replaced. The City received an \$85,000 rebate cheque from Horizon Utilities in 2008 for this program as part of Horizon Utilities' Energy Conservation Fund grant program.

The Corporation has begun to generate energy and reduce emissions through the use of wasted methane gas emissions. A 1.6 MW Cogeneration Facility, located at the Woodward Avenue Wastewater Treatment Plant, takes methane gas created from the wastewater treatment process to produce electricity and heat. The Cogeneration Facility converts 32 per cent of the available energy in the digester gas to electrical energy (electricity) and 48 per cent to thermal energy (heat). The power and heat will be used to operate the Woodward Wastewater Treatment Plant. It is anticipated that the facility will produce 13.6 million kilowatt hours of electricity per year. This is equivalent to the electrical needs of approximately 1,600 households.

This venture is forecasted to provide the City of Hamilton with a net benefit of up to \$1 million through the energy sales to the province while the heat that is harvested from the engine heats wastewater facilities and saves in natural gas costs.

The City is also undertaking a pilot project of vertical small wind turbines with Cleanfield Energy Corporation to examine the feasibility of these units in Hamilton.

In addition to the air and greenhouse gas impacts of fossil fuel use, is the risk of reduced energy sources and availability in the future. The risk of Peak Oil – where future world oil production reaches a peak and then rapidly declines resulting in higher energy costs – is also a driver towards cities seeking alternative means of generating and producing energy to create “energy security”. The City began to explore the future impacts of energy availability in Hamilton and should consider continued research and action to incorporate peak oil scenarios into energy management.

**Action:**

- **Continue to pursue energy conservation and demand management within all City operations (as outlined in the Corporate Energy Policy).**

- **Consider the energy usage and associated air and greenhouse gas emissions in City equipment operations and purchase.**
- **Examine the use of renewable technologies in supplying energy to new and existing City Facilities (as outlined in the Corporate Energy Policy).**

### **A. i) Waste Management & Reduction - Mitigation**

Landfilling is the most common waste disposal method and produces the most greenhouse gas emissions when there is no landfill gas capture system in place. Anaerobic decomposition of waste in landfills produces methane, a greenhouse gas 21 times more potent than carbon dioxide.<sup>15</sup> Incineration of waste results in emissions of both carbon dioxide and nitrous oxide, however, combusted waste can displace the burning of fossil fuels by producing electricity or heat for nearby buildings or industry. The transportation of waste to disposal sites produces greenhouse gases from the fuel used in the equipment.

Hamilton's Solid Waste Management Master Plan (SWMMP), was approved by City Council in December 2001. The waste reduction target is established for 65% diversion from landfill by 2010, based on 2000 waste generation rates. Amongst the recommendations of the Plan are a three-stream waste collection system (recyclables, organics and residuals), and centralized waste composting facility and community recycling and reuse centres.

Recycling can have a large impact on reducing greenhouse gases, because it replaces some of the raw materials and energy used in the manufacturing process. Using recycled material not only reduces emissions used to produce these products, but also the energy required for manufacturing. For materials that require intensive processing, such as steel, plastic and aluminium, recycling can reduce emissions by about two tonnes of carbon dioxide equivalent per tonne of product. Paper recycling also increases carbon storage because it leaves more trees growing in the forest.

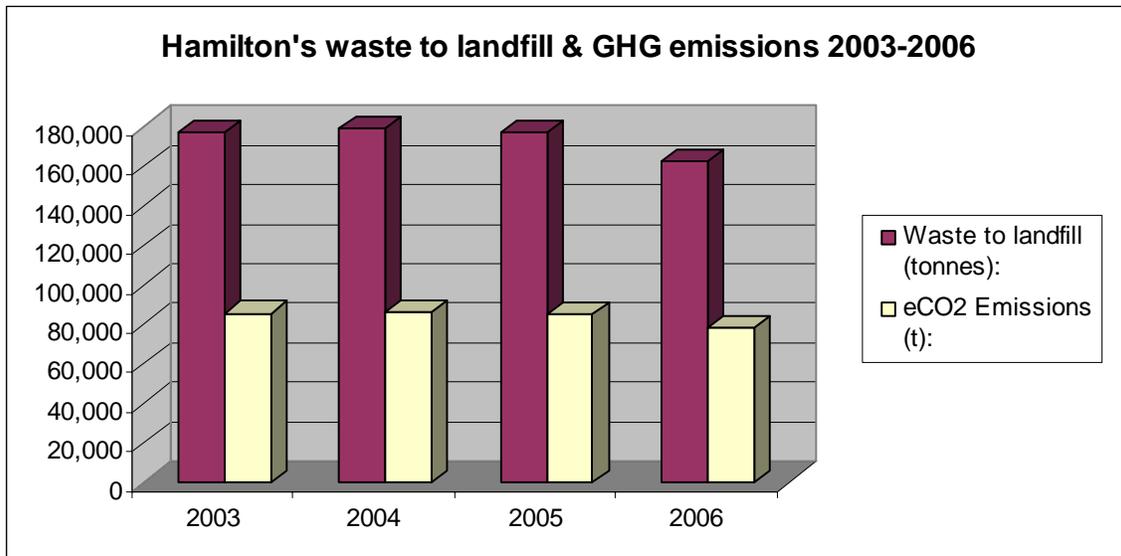
Composting is an option available for organic materials including food scraps and yard waste. Because it involves aerobic decomposition, composting does not generate methane emissions.

The City has undertaken a number of waste management initiatives in the SWMMP to divert and reduce the amount of waste to landfills, thereby reducing the amount of greenhouse gases. These programs include the organic waste Green Cart program, the Blue Box recycling program, community recycling centres and household special waste. Hamilton has also built a central composting facility, located on former industrial land, to process the organic materials diverted through the green cart program.

Since 2003, the annual waste generated by the City of Hamilton has increased 10% (23,427 tonnes); however, the amount of waste sent to landfill has decreased 8.5% (14,848 tonnes). Improved waste diversion has resulted in a reduction in eCO<sub>2</sub> emissions of 7,153 tonnes per year. eCO<sub>2</sub> reductions are anticipated to increase considerably with the full operation of the green cart program. The figure below indicates the annual waste generated and estimated greenhouse gas emissions per year.

---

<sup>15</sup> United States Environmental Protection Agency (2006) *Global Warming*



The Waste Management Division is currently constructing a landfill gas collection system at the Glanbrook Landfill, which will capture 80% of the methane produced at the site through collection of gas produced from waste disposed in the landfill over several years. It will be operational in April 2008 and will result in eCO<sub>2</sub> reductions of 96,330 tonnes per year thereafter.

The City is undertaking a review of options to address the remaining solid waste after 65% diversion is achieved. The Niagara-Hamilton WastePlan is a joint initiative of the Regional Municipality of Niagara and City of Hamilton to work together to manage solid waste.

The process recognizes that diversion programs help reduce the amounts of waste going into each community's landfills in the short term, but for the long term, the option of disposal may greatly reduce the amount of waste that is sent to landfill and needs to be considered (e.g. thermal technologies, mechanical and biological processes, etc.).

The WastePlan is being carried out under the Provincial Environmental Assessment Process and is a multi-year study that involves extensive community consultation. Each preferred option undergoes an extensive assessment of impacts to the economy, community and the environment in categories such as air quality and climate change.

**Action:**

- **Continue the reduction and diversion of waste through recycling, green carts and composting and reduce environmental impacts associated with landfills.**
- **Determine actions to address the 35% of remaining waste, recognizing potential air pollutants, toxins and greenhouse gas emissions in actions.**
- **Consider air quality impacts and greenhouse gas emissions in the operations of city waste facilities and fleets.**

**PART III – IMPLEMENTATION & DELIVERY**

A Corporate Air Quality and Climate Change Strategic Plan must recognize the complexities of climate change and linkages with issues (poor air, water and land, health, economic) and strive to take action, where appropriate, to address the impacts and sources of climate change and poor air quality through Corporate operations and policies.

In the development of actions under the Corporate Air Quality & Climate Change Strategic Plan, comparable municipal plans from North America, Canada and Ontario were studied to compare Corporate activities to address climate change and air quality to identify “gaps” that need to be addressed and supported by the Corporation (**see Table 3**).

**Table 3: Summary of Climate Change actions compared to other Municipalities- Adaptation**

	Hamilton	Ontario			Canada		North America	
		London	Toronto	Ottawa	Calgary	Vancouver	Minneapolis	Seattle
<b>Corporate GHG Reduction Targets</b>	10% below 2005 levels by 2012, 20% below 2005 levels by 2020	Track emissions, no target at this time	Reduced by 20% between 1990-2005	20% by 2012	50% by 2012	20% by 2010	12% by 2012, 20% by 2020	Emissions reduced by more than 60% (2006)
<b>Air Quality (Smog Response)</b>	Yes	Anticipated	Yes	Developing	Developing	Yes	Yes	Yes
<b>Adaptation Plan</b>	GRIDS Vulnerability Scan		Conducting vulnerability scans	To be developed				
<b>Heat/Cold Alerts</b>	Yes	Yes	Yes	Yes				Heat alerts
<b>Water Quality &amp; Design</b>	Water & Wastewater Master Plan, Stormwater Master Plan	Monitor programs	Master Plan-Wet Flow Management	Water Efficiency Strategy	Water Efficiency Plan	Yes	Management Plan	Under discussion
<b>Tree Planting &amp; Preservation</b>	Currently – 17%, Goal 30%, Street Tree Planting, Tree By-Law	Community Tree Planting, 2002 Inventory, carbon sequestration project	Currently 20%, Goal 35%	Tree restoration and Environmental Enhancement (TREE) program, Street tree maintenance		Tree trust, Tree By-law	Urban Forest Policy, Tree Conservation By-law, Tree preservation standard for new developments	Plan increase of urban forest by 2/3 over 30 years, All new developments require open space and trees

**Table 3: Summary of Climate Change actions compared to other Municipalities- Planning**

	Hamilton	Ontario			Canada		North America	
		London	Toronto	Ottawa	Calgary	Vancouver	Minneapolis	Seattle
<b>Land Use Planning – Compact Urban Form</b>	GRIDS	Smart Growth & Placemaking	Focus Development along centres and corridors	Growth Management	Sustainable Suburbs Study		Encourage reduction in auto reliance	City Centre Strategy, zoning changes
<b>Land use Planning – Green Space</b>	Amendments to OP & Zoning By-laws			Greenspace Master Plan	Open Space Plan	Open Space Plan	Open Space Plan	Open Space Plan
<b>Built Environment &amp; Green Design</b>	3 year LEED pilot program	LEED, Energy retrofits	Green Building standards, Green Roofs, Energy retrofits	LEED, Energy retrofits	Sustainable Building Policy (LEED), Environmental Construction Operations (ECO) Plan, Contractor Environmental Responsibilities Package (CERP)	LEED, Energy retrofits	Energy efficiency standards, Green Roofs, Energy retrofits	LEED, Residential Energy Code, Energy retrofits
<b>Transportation Plan</b>	Transportation Master Plan – bike, transit, pedestrian, Shifting Gears	Yes, Bike Plan	Yes, Transit City Plan, Bikeway network	Transportation Master Plan, O-Train, cycling & walking paths, Rack & Roll service, Bike Plan	GOPlan, Transit Orientated Development Guidelines, Pathway & Bikeway Plan	Yes, Intelligent Transport System, Central Valley Greenway	Yes, Reinvigorate transit with Light Rail & bus	Street car, light rail, Bike Station transportation Pedestrian Master Plan
<b>Transportation Demand Management</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Table 3: Summary of Climate Change actions compared to other Municipalities- Operations**

	Hamilton	Ontario			Canada		North America	
		London	Toronto	Ottawa	Calgary	Vancouver	Minneapolis	Seattle
<b>Green Fleets</b>	Green Fleet Implementation Plan, hybrid vehicles (including buses), natural gas, biodiesel, vehicle right-sizing. First E3 green rated fleet	Intelligent vehicle tracking & Monitoring, hybrids, ethanol and biodiesel	Green Fleet Plan, hybrid vehicles (including buses), biodiesel, vehicle right sizing	Green Fleet Plan, hybrid buses and biodiesel, ethanol-blended fuel	Green Fleet Plan, hybrid vehicles, hybrid taxis, Ride the Wind bus program, integrating hybrid and biodiesel into fleet, C Trains, vehicle right-sizing, transit hydrogen study	E3 fleet program, hybrid vehicles, hybrid taxis, exploring biodiesel, electric trolleys	Initiating a program, hybrid and ethanol vehicles.	Green Fleet Plan, hybrid vehicles, segways, vehicle right-sizing, exploring biodiesel.
<b>Energy Conservation &amp; Demand Management</b>	Corporate Energy Policy	Corporate Energy Management Plan, Energy Matters Technical & steering Committee, wind study	Energy Conservation goals, exploring generating and purchasing green energy	Employee Energy Efficiency Program, energy audits, exploring geothermal, solar & wind, exploring purchasing green energy	Energy Management Office & Performance Contract, solar, exploring purchasing green energy	Air Quality Management Plan, energy purchasing policy, district energy system, purchasing Green power certificates	Energy reduction goals, solar panels, district heating & cooling	Created Dept. incentives, Green Up program
<b>Lighting – CFLs or LED Conversions</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Operations – Traffic Signal Control and/or lighting conversion</b>	Yes	Yes	Yes	Yes	Yes			Yes

**Table 3: Summary of Climate Change actions compared to other Municipalities- Operations**

	Hamilton	Ontario			Canada		North America	
		London	Toronto	Ottawa	Calgary	Vancouver	Minneapolis	Seattle
<b>Operations – Small engines retrofit</b>	Exploring		50% by 2020	Exploring				Yes
<b>Operations – Street sweeping fleet</b>	Purchased PM compliant street sweepers	Purchased PM compliant street sweepers	Purchased PM compliant street sweepers					
<b>Operations – Idling Control</b>	Idling by-law	Idling by-law	Idling by-law	Idling by-law	Vehicle idling reduction policy	Idling by-law	Idling Ordinance	Employee education campaign
<b>Operations – Procurement</b>		Yes	Yes		Yes	Yes	Yes	Yes
<b>Waste Management &amp; Reduction</b>	Solid Waste Management Plan	Waste Management By-law	Waste Mgmt Plan	Waste Mgmt Plan	Waste Mgmt Plan	Waste Mgmt Plan	Waste Mgmt Plan	Waste Mgmt Plan
<b>Waste Diversion (Recycling, Composting)</b>	65% reduction by 2010, Green cart, curbside recycling, composting,	Curbside recycling,	100% diversion by 2010, Green bin	60% diversion by 2008, curbside recycling, composting, yellow bag program	80% recycle by 2020, curbside recycling in 2009,	Target being decided	Promoting solid waste reduction, recycling credit, curbside collection of electronics	
<b>Energy from Waste/Methane Capture</b>	Gas collection by 2008	Proposing landfill power plant, gas collection	Methane collection by 2009	Yes (Trail Road), gas collection	Yes, Methane Optimization Policy for energy		Yes	Flaring methane



When Hamilton is compared to these seven cities, a number of mutual actions the Corporation have undertaken that address climate change and air quality are apparent. These include;

- A Greening the Corporate Fleet Plan
- The introduction of hybrid vehicles and alternative fuels
- A Corporate Smog Response Plan
- A City Idling Control By-law
- A Corporate Energy Policy
- Use of renewable energy
- Replacement of traffic signals with energy efficient LEDs
- Waste diversion (organic and source separation)
- Water conservation
- Encouraging compact urban form in policy
- Particulate Matter (PM) compliant street sweepers.

Although many of these actions are comparable to other municipalities, some are still unique to Hamilton such as particulate compliant street sweepers and diesel-electric buses that address local issues of air quality.

“Gaps” in addressing air quality and climate change were also identified. These “gaps” need to be improved upon or require actions to be undertaken by Council and staff in order for the Corporation to have a more complete strategic action plan.

These “gaps” include:

- Transportation:
  - Support of Transit within the City
  - Increased Transportation Demand Management and encouragement of alternative modes of transportation (walking, cycling, carpooling) and discouragement of single occupancy in vehicles
- Investing in the “Green Infrastructure” to adapt and mitigate impacts.
  - Focus on forestry in urban areas – encourage more sustainable tree canopy
  - Encouragement and Development of green buildings and standards
- Undertake Adaptive planning to reduce the risks of climate change impacts in policies and actions.

By addressing these areas by 2012, the Corporation can build on actions to date, raise its profile and lead on environmental issues, reduce corporate costs of energy, address its commitments to Vision 2020, and begin a path towards becoming climate resilient.

## **A) Delivery of Corporate Actions on Air Quality & Climate Change**

Delivery of the Corporate Air Quality & Climate Change Strategic Plan will be undertaken through a proposed Corporate management and reporting system including:

- A Corporate Air Quality & Climate Change Group
- Senior Management Team & Council
- Climate Change Roundtable

## A. a) Corporate Air Quality and Climate Change Working Group

*An Inter-Departmental Air Quality and Climate Change Work Group would co-ordinate and have responsibility for the actions of the corporation to address air quality and climate change and serve as a clearing house to disseminate information on corporate actions and priorities regarding air quality and climate change.*

Phase 1 Report (PED06336)

A Corporate Air Quality & Climate Change Working group has been formed with respective Corporate Departments to co-ordinate air quality and climate change actions between Departments so as to maximize the outcome of each initiative and generate efficiencies within the Corporation. Representation in the group currently contains members from Planning & Economic Development - Strategic Planning (Air Quality, Sustainability and Policy), Public Health – Health Protection, Public Works - Capital Planning & Implementation (Transportation), Energy, Fleets & Facilities (Office of Energy Initiatives and Central Fleet) Waste Management, Water & Wastewater Management, Forestry, and Emergency Services. The objective of the group is to improve air quality in Hamilton and address climate change throughout corporate operations.

Moving forward on corporate actions to address climate change and air quality, the group will require additional members representing Community Services, Transit, Traffic Operations & Engineering, and Purchasing

In 2007, the Working Group has been examining air quality and climate change with respect to their own Departmental operations and corporately. The group has assessed and compared actions with other municipalities, communicated actions to the public and Council through various venues (staff reports, conferences, trade shows, community events, staff requests), identified areas that need to be supported to address air quality and climate change impacts, and have proposed short and medium term recommendations, identified in this report, to move the Corporate Air Quality and Climate Change Plan forward.

In future, the group will:

- Identify which City business units should have Air Quality & Climate Change initiatives planned or underway. These include energy conservation initiatives.
- Convene a group in these business units to share information and develop opportunities to work together.
- Communicate the Corporation's actions on air quality and climate change to Council and the public.
- Provide information to the Senior Management Team and program directors on Corporate Air Quality and Climate Change actions and results.
- Participate in federal, provincial, and municipal forums addressing Air Quality & Climate Change issues.
- Research actions undertaken by other cities.
- Hold an annual public event to showcase Hamilton's progress on Air Quality & Climate Change initiatives to its citizens.

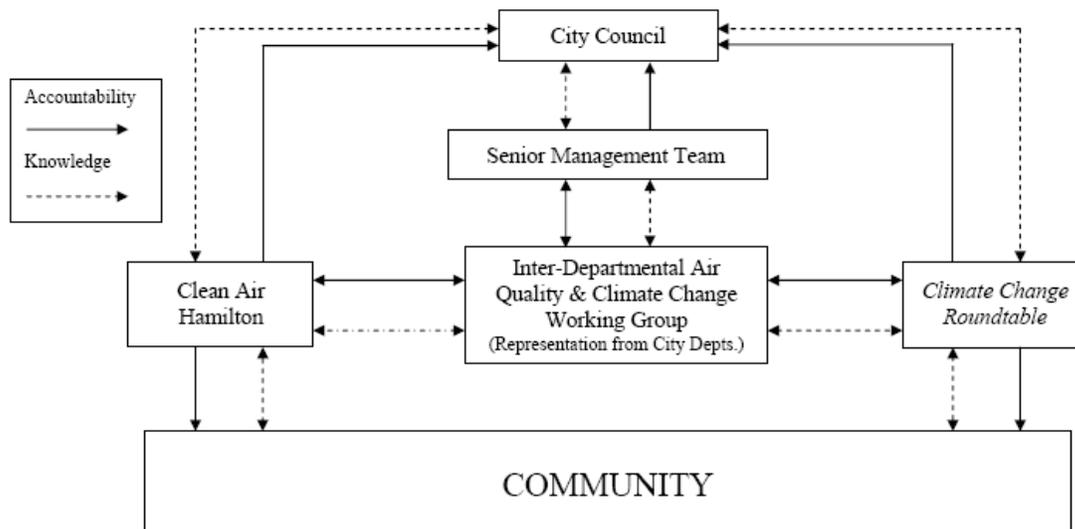
The Corporate Air Quality & Climate Change Working Group will continue to provide a venue for Departments to communicate with each other on their respective activities and develop opportunities to work together and implement the Corporate Air Quality & Climate Change Strategy.

### A. a. i) Senior Management Team & City Council

Council in its role in providing overall leadership for the City will be presented with an annual report by Staff on the Corporation's actions to improve air quality and reduce greenhouse gases starting in 2009. Council also has the ability in enacting laws or allocate City resources for programs, services, and activities that address climate change and air quality that promote community support and understanding.

**Figure 8** below outlines the proposed reporting structure for the delivery of Corporate actions on air quality & climate change.

**Figure 8: Reporting structure of the Corporate AQ&CC Plan**



**Figure 8** also identifies two bodies that would serve in the provision of policy and research advice on air quality and climate change to the Corporation and encouraging actions in the wider Hamilton community. These two bodies are *Clean Air Hamilton* and a proposed future *Climate Change Roundtable*.

### A. a. ii) Clean Air Hamilton

*Clean Air Hamilton* is a multi-stakeholder group of academia, government, industry, environmental and local citizen groups dedicated to improving air quality through the promotion of realistic, science-based decision-making and sustainable practices. *Clean Air Hamilton* is supported by Council, provides policy advice to all levels of government, and reports annually to Council on actions to improve air quality in Hamilton. *Clean Air Hamilton* would continue to advise the City on matters of air quality and work with government partners, community stakeholders and the private sector in developing strategies to improve air quality in Hamilton.

### A. a. iii) Climate Change Roundtable

A future *Climate Change Roundtable* would advise the City on matters of climate change and work with government partners, community stakeholders and the private sector in developing strategies to address climate change in Hamilton.

Representatives of the group would be from the City, industry, community/citizens, government, academic, health professionals and similar partners who can engage and promote actions to reduce greenhouse gases and adapt to climate change within the City of Hamilton. This group would have links to the community on climate change actions for the City, and build partnerships to undertake joint programs/actions on air quality and climate change.

### A. b) Corporate Emissions Inventory

The former Region of Hamilton-Wentworth conducted a partial greenhouse gas emissions inventory in 1999. The greenhouse gas emissions for regional operations were calculated in the areas of landfills, Regional buildings and fleets, HSR and police services. The Region committed to corporate reductions of 20% of greenhouse gas emissions (14,802 tonnes) and a reduction of 6% community-wide (5,884,050 tonnes) from 1994 levels by 2005. The 1999 analysis of Corporate greenhouse gas emissions between 1994 and 1998 showed a reduction of 3.8% in municipal operations that was negated by an increase of 5.4% of City-wide emissions.

**Table 4: Corporate Greenhouse Gas Emissions (1999)**

	1994 eCO <sub>2</sub> (Tonnes)	1998 eCO <sub>2</sub> (Tonnes)	Trend to 2005	Goal
Municipal Operations	18,503	17,800 (3.8% reduction)	16,569 (10.45% reduction)	14,802 (20% reduction)
City-wide Emissions	6,259,628	6,599,162 (5.4% increase)	7,697,280 (22.9% increase)	5,884,050 (6% reduction)

Note: eCO<sub>2</sub> is a measure of all Green House Gases, such as nitrous oxide and methane, adjusted to equivalent CO<sub>2</sub> units)

Due to amalgamation and the changes in Corporate structure and operations, the results of the 1999 inventory are impossible to assess and compare to current City operations. Determining a baseline municipal operations emissions figure for 1990 would be costly, highly extensive, and require a historical analysis of all the operations of all former municipalities. Since amalgamation, no resources have been available to update and track the greenhouse gas emissions of the City through an emissions inventory.

The Corporate Air Quality and Climate Change Working Group will examine a number of greenhouse gas and related environmental inventories to determine the best inventory for City Operations. Departmental representatives on the Corporate Air Quality and Climate Change Working Group will collect the data required for an inventory. Staff will partner with external stakeholders to develop a community climate plan and inventory. Staff will report to Council on the Inventory and results in 2009.

The Corporation is still committed to the 20% reduction below 1990 levels, but it is proposed to extend the deadline to ensure sufficient time to properly inventory Corporate emissions and implement abatement actions. The 6% emissions reduction target of 2005 levels by 2012 is an interim target for the Corporation. Undertaking a current and proper emissions inventory using 2005 data for Corporate operations will determine if the interim target has been achieved and permit the refinement of the target to ensure continuous improvement.

#### Action:

- **Undertake an emissions inventory for the Corporation (2005 base year) and the City of Hamilton (2006 base year)**

- **City Council to review and adjust emissions target accordingly to emissions inventory results.**

### **A. c) Research on New Policies & Strategies**

Research helps an organization identify its role on air quality and climate change issues, assess what actions it can undertake, and influence others to take action. The Corporation does not often undertake original research due to resources and mandate limitations.

Partnerships with other governments, academics and organizations assist the Corporation to obtain knowledge on air quality and climate change. The transfer of knowledge to Departments through the Corporate Air Quality and Climate Change Working Group will keep corporate activities relevant and current.

Original local research on air quality in Hamilton is undertaken through *Clean Air Hamilton* and the City's membership with the Greater Toronto Area (GTA) Clean Air Council. *Clean Air Hamilton* initiates research on health and air quality in Hamilton, provides policy advice, and encourages actions to improve local air quality by individuals, industries and other sources. *Clean Air Hamilton* recognizes that measures to reduce greenhouse gases will translate directly into local air quality improvements. (Clean Air Hamilton, 2007).

#### **Upwind Downwind Conference**

Since 1992, *Clean Air Hamilton* and the City of Hamilton have hosted a biennial conference on issues of air quality, health and planning. This provides a local and provincial forum for improved understanding of air quality and human health of cities. The conference highlights the roles that industry, community groups and governments can play in achieving air quality improvements. The conference generates many ideas and is an excellent opportunity for Hamilton and other communities to share practical solutions to air quality problems. In 2008, the theme of the conference address climate change in recognition of the linkages between improving air quality and reducing greenhouse gases.

Research on climate change is now primarily a partnership activity with other levels of government, organizations, municipalities, local industries, academics and community groups.

The GTA Clean Air Council is an intergovernmental working group that promotes the reduction of air pollution and increased awareness of Regional air quality issues. The GTA Clean Air Council has also begun to recognize the need to undertake research on climate change impacts in southern Ontario. It has begun work on adaptation to climate change through the Clean Air Partnership's Climate in Focus program ([http://www.cleanairpartnership.org/climate\\_change.php](http://www.cleanairpartnership.org/climate_change.php)).

The Alliance for Resilient Cities (ARC) is a recent collaborative network of decision-makers that supports the efforts of local governments to identify the impacts of climate change, analyze adaptation options and develop action strategies to protect their communities. (<http://www.cleanairpartnership.org/arc.php>)

## **A. d) Response, Engagement & Communication**

The Corporate Air Quality and Climate Change Strategic Plan needs to respond to enquiries and proposals from the public, internal Departments, different levels of government, international activities, industry, stakeholders, etc. These differing interests influence how, when, and to what degree actions undertaken by the Corporation address air quality and climate change.

Departments within the Corporation are responsible for responding to enquiries and/or proposals on specific issues concerning their programs that may impact on air quality or climate change. They will also be responsible for the promotion and marketing of their individual actions.

The Corporate Air Quality and Climate Change Working Group will:

- Communicate the Corporation's actions on air quality and climate change internally and to the public and other jurisdictions.
- Provide information to the Senior Management Team and program directors on Corporate Air Quality and Climate Change actions and results.
- Participate in forums addressing Air Quality & Climate Change issues (e.g. Environment Week, Shared Air conference, Energy Matters conference, Sustainable Transforum, Globe Conference).
- Hold an annual public event to showcase Hamilton's progress on Air Quality & Climate Change initiatives.

Reporting of the actions undertaken through the Corporate Air Quality & Climate Change Strategic Plan will be presented to City Council on an annual basis starting in 2009 and is proposed to be (in-line with or incorporated into) the annual reporting on corporate actions addressing energy, waste and water.

## **B) Implementation of Corporate Actions on Air Quality & Climate Change**

A Corporate Air Quality and Climate Change Strategic Plan is a long term strategy. Implementation will be phased and actions will cut across many Departments and programs.

**Appendix C** of this report provides a listing of some of the programs that the Corporation has undertaken to address air quality and climate change that combined form the baseline of programs for the Corporate Air Quality & Climate Change Strategic Plan. The short to medium timelines within each program is also outlined.

An analysis of Air Quality & Climate Change Plans and actions from six cities across North America compared with the activities by Hamilton that address air quality and climate change and identification of Corporate "gaps" also helped established recommendations that the Corporation should address under a Corporate Strategic Air Quality & Climate Change Plan.

### **Recommendations:**

Immediate next steps to be taken under the Corporate Air Quality and Climate Change Strategic Plan include:

- **Establish the Corporate Air Quality and Climate Change Working Group.**

- **Undertake an assessment and inventory Corporation greenhouse gas emissions (2005 base year) and City emissions inventory (2006 base year) and report to Council the results of analysis in 2009**

To support actions under the Corporate Air Quality and Climate Change Strategic Plan, Council should:

- **Direct the inclusion of air quality and climate change objectives in all Corporate and Department Strategic Plans.**
- **Direct all Departments to take appropriate action and incorporate responses to potential climate change risks into corporate operations.**

In the short term to medium term (2007-2011), actions by Departments under the Corporate Air Quality and Climate Change Strategic Plan to improve air quality, reduce greenhouse gases and adapt to a changing climate include:

#### *Adaptive Planning*

- **Undertake vulnerability scans of climate change impacts on municipal operations.**
- **Develop and maintain a comprehensive risk based analysis procedure, in conjunction with the vulnerabilities scan, to determine climate change based high risk events in order to support co-ordinated inter-departmental mitigation programs to reduce risks and vulnerabilities.**
- **Research climate adaptation strategies for buildings and city infrastructure**
- **Enhance disaster preparedness and emergency response plans. Strengthen emergency communications, emergency preparation, public education, and emergency response coordination (e.g. planning for the combat of infectious diseases, illness, temperature and poor air quality induced health impacts)**

#### *Transportation*

- **Support public transit as a viable transportation mode within the City through a Transit Master Plan.**
- **Commit to Transportation Demand Management by encouraging and expanding the number of employees using Transportation Demand Management services (car pooling, car sharing, use of transit, flexible work time, telework, and cycling).**
- **Continue to green the corporate and transit fleet through the investigation and incorporation of hybrid and new vehicle technologies, right sizing and alternative fuels to replace to replace older vehicles coming out of service.**

#### *Energy Management & Conservation*

- **Encourage energy conservation and demand management within City operations (as outlined in the Corporate Energy Policy).**
- **Examine the use of renewable technologies in supplying energy to new and existing City Facilities (as outlined in the Corporate Energy Policy).**
- **Consider the energy usage and associated air and greenhouse gas emissions in City equipment operations and purchase.**

- **Encourage energy retro-fits, especially in low income neighbourhoods and housing.**

#### *Land-Use Planning*

- **Implement the approved land use planning related growth strategy (GRIDS and the recommendations of the associated Master Plans).**
- **Examine and incorporate air quality and climate change policies into the City's Official Plan.**

#### *Green Infrastructure*

- **Undertake a tree inventory with community support to provide information for a Forestry Management Plan**
- **Develop a comprehensive Forestry Management Plan with sustainable canopy targets**
- **Create a Fund to preserve and enhance parks, open spaces, and forests in the Hamilton community.**
- **Incorporation of energy efficiency, waste management, water efficiency and low air and greenhouse gas emissions in the retrofitting of Hamilton City Hall**
- **Study the feasibility of green and white roofs in the downtown of Hamilton**
- **Adopt green development standards (LEED, Energy STAR) for public and private developments and have City staff become LEED Accredited professionals.**

#### *Water & Wastewater Management*

- **Encourage water conservation in Hamilton to ensure adequate supplies of water under extreme weather scenarios (flooding, drought, lower lake levels, brownouts)**
- **Incorporate air quality and climate change in the planning of water, wastewater and stormwater infrastructure and policies to ensure adaptive response to a changing climate.**
- **Consider impacts on local air quality and reduction of greenhouse gases in City water & wastewater operations**

#### *Waste Management*

- **Continue the reduction and diversion of waste through the use of recycling, green carts and composting which reduces environmental impacts associated with landfills.**
- **Determine actions to address the 35% of remaining waste, recognizing potential air pollutants, toxins and greenhouse gas emissions in actions.**

By undertaking these actions and creating the supporting initiatives (e.g. the Corporate Working Group and tracking emissions), the Corporation can build on existing programs and address air quality and climate change in a more comprehensive manner. Moreover, the Corporation will be striving to get its own operations in order to reduce the corporate

costs of energy, encourage renewal of physical assets, and address its sustainability commitments to Vision 2020.

Ultimately, the Corporate Air Quality and Climate Change Strategic Plan helps guide the Corporation's future policies and operations in such a way to ensure that Corporate actions are consistent with the goals of improving air quality, mitigating greenhouse gases, and adapting to the effects of climate change.

## Conclusion

Climate Change and poor air quality are issues being examined and addressed by a number of municipalities. Poor air quality and the potential impacts of climate change have effects on public health, municipal operations, City infrastructure, the local economy, and supporting ecosystems.

The Corporation has already begun to address air and greenhouse gas emissions in areas of smog day response, greening the corporate fleet, waste management, water management, land-use and transportation planning, and vehicle idling.

The Corporation will strive to reduce greenhouse gas emissions in its operations starting with a 10% reduction of 2005 levels by 2012, followed by a 20% reduction by 2020. This report outlines the actions the Corporation will undertake under a Corporate Air Quality and Climate Change Strategic Plan in the short and medium term (2007 – 2011). The Corporate Air Quality and Climate Change Strategic Plan is a long term strategy with phased implementation and actions that cut across many Departments and programs.

Actions include:

- Undertaking adaptive planning to reduce risks in policies and actions.
- Undertaking a Corporate and City emissions inventory to calculate the levels of emissions in Hamilton.
- Transportation:
  - Increased support of Transit within the City.
  - Increased Transportation Demand Management and encourage alternative modes of transportation (walking, cycling, carpooling) and discourage the use of single occupancy vehicles.
  - Continuation of greening the corporate fleet.
- Investing in the “Green Infrastructure” to adapt and mitigate impacts.
  - Focus on forestry and encourage more sustainable tree canopy in urban areas.
  - Encouragement and Development of green buildings and standards.
- Energy Conservation and Demand Management
  - Examination of renewable energy technologies and encouraging energy retro-fits.
- Waste Management
  - Continue reduction and diversion of wastes from landfills through recycling and composting.

Ultimately, the Corporate Air Quality and Climate Change Strategic Plan helps guide the Corporation’s future policies and operations in such a way to ensure that Corporate actions are consistent with the goals of improving air quality, mitigating greenhouse gases, and adapting to the effects of climate change.

## References and Sources of Information:

- Canadian Climate Impacts and Adaptation Research Network (C-CIARN) (2007)  
<http://www.c-ciarn-ontario.ca/english/science.html>
- Canadian Climate Impacts and Adaptation Research Network (C-CIARN) (2006)  
***Adapting to Climate Change. An Introduction for Canadian Municipalities.*** 32 pgs.
- Canadian Urban Transit Association (CUTA) (2007)  
<http://www.cutaactu.ca/>
- Centre for Health and the Global Environment, Harvard Medical School (2005)  
***Climate Change Futures Health, Ecological and Economic Dimensions.*** 142 pgs.
- City of Hamilton (2004) ***2004 Environmental Scan.*** 71 pgs.
- City of Hamilton (2004) ***Annual Sustainability Indicators Report*** 180 pgs.
- City of Hamilton (2004) ***Vision 2020 Corporate Action Inventory***  
<http://www.vision2020.hamilton.ca/achieve/city-action-inventory/default.asp>
- City of Hamilton (2005) ***Public Works Community Report on Storm Water Management – When Mother Nature Strikes.*** 4 pgs.
- City of Hamilton (2005) ***City of Hamilton Water and Wastewater Master Plan Policy Paper (PW05050).*** 18 pgs.
- City of Hamilton (2006) ***Growth Related Integrated Development Strategy- Final Report.*** 89 pgs.
- City of Hamilton (2006) ***Energy Retrofit Pilot Program: Implementation Phase (PW06078/FCS06067).***
- Public Works, Infrastructure & Environment Committee- June 2006.
- City of Hamilton (2006) ***Air Quality and Climate Change Corporate Strategic Plan- Phase I.*** 56pgs.
- City of Hamilton (2007) ***Hamilton Transportation Master Plan.*** 85 pgs.
- City of Hamilton (2007) ***Hamilton Stormwater Master Plan.*** 268 pgs
- City of Toronto (2006) ***Making a Sustainable City Happen The Toronto Green Development Standard.*** 87pgs.
- Clean Air Hamilton (2004) ***Clean Air Hamilton Progress Report 2003 -2004.*** 29 pgs.
- Clean Air Hamilton (2006) ***Clean Air Hamilton Progress Report 2004 -2005.*** 55 pgs.
- Clean Air Hamilton (2007) ***Clean Air Hamilton Progress Report 2005 -2006.*** 71 pgs.
- The Clean Air Partnership (2005) ***A Model Clean Air Plan for the Living City.*** 56 pgs.
- The Clean Air Partnership (2006) ***Adapting to Climate Change in Toronto.***  
[http://www.cleanairpartnership.org/climate\\_change.php](http://www.cleanairpartnership.org/climate_change.php)
- The Clean Air Partnership (2006) ***A Scan of Climate Change Impacts on Toronto.*** 50 pgs.
- Conference Board of Canada (2006) ***Adapting to Climate Change Is Canada Ready?*** 15 pgs.
- Conservation Bureau (2007) ***Ontario- a new era in electricity conservation 2006 Results.*** 33pgs.
- Ebbert, Stephanie (2007) ***Massachusetts steps up climate rules for developers.*** *Boston Globe*, April 22, 2007. 2 pgs.

ECO5 Inc. (2004) **Hamilton's Vulnerability to Climate Change, GRIDS Background Study**. 41 pgs.

Environment Canada (2006) **Clean Air Online**.  
<http://www.ec.gc.ca/cleanair-airpur/>

Federation of Canadian Municipalities (2005) **Partners for Climate Protection**.  
<http://kn.fcm.ca/>

Federation of Canadian Municipalities (2005) **Quick Action Guide: Municipal Action on Climate Protection**. 12 pgs.

Gilbert, Richard (2006) **Hamilton: The Electric City**. 76 pgs.

Global Change Strategies International Inc. (2003) **Municipal Risk Assessment: Investigation of the Potential Municipal Impacts and Adaptation Measures Envisioned as a result of Climate Change**. 52 pgs.

Global Change Strategies International Inc. (2005) **An Overview of the Risk Management Approach to Adaptation to Climate Change in Canada**. 28 pgs.

Government of Canada (2004) **Climate Change, Impacts & Adaptation: A Canadian Perspective**. 201 pgs

Government of Canada (2007) **Turning the Corner An action Plan to reduce greenhouse gases and air pollution**. <http://www.ecoaction.gc.ca/turning-virage/index-eng.cfm>

Government of Canada (2007) **Government of Canada Climate Change Website**  
[http://www.climatechange.gc.ca/english/climate\\_change/](http://www.climatechange.gc.ca/english/climate_change/)

Government of Ontario (2007) **Ontario Greenhouse Gas Emissions Targets: A Technical Brief**. 13 pgs.

Hamilton Community Foundation (2002) **The Future We Want: Strategic Focus on the Protection of Hamilton's Environment**. 26 pgs.

Health Canada (2003) **Potential Climate Change and health and Well-Being Adaptation Strategies**. [http://www.hc-sc.gc.ca/ewh-semt/climat/measures-adaptation-mesures\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/climat/measures-adaptation-mesures_e.html)

Hyslop, Adam (2005) **Ontario's Emergency Management Act & Municipal Climate Change Strategies**. 11 pgs.

Hyslop, Adam (2006) **Co-benefits of Municipal Climate Change Mitigation Strategies**. 18 pgs.

Independent Community Panel (SERG) (2006) **Independent Community Panel Report to the City of Hamilton**. 57 pgs.

International Council for Local Environmental Initiatives (ICLEI) (2005) **Urban Heat Islands**  
<http://www.hotcities.org/>

Institute for Catastrophic Loss Reduction (2003) **Climate Change, Natural Hazards and Cities**. 16 pgs.

Jerrett, Michael and Talar Sahuvaroglu (2003) **A Public Health Assessment of Mortality and Hospital Admissions Attributable to Air Pollutants in Hamilton**. 47 pgs.

Lay, Jennifer (2005) **Lessons Learned on Initiating a Municipal Corporate Climate Change Program**. 25 pgs.

McGeehin, Michael and Maria Mirabelli, (2001). **The Potential of Climate Impacts of Climate Variability and Change on Temperature-Related Morbidity and Mortality in the United States**. Vol. 109, Supp 2.

Natural Resources Canada (2006) **Office of Energy Efficiency**. <http://oee.nrcan.gc.ca/>

Ontario Medical Association (2005) **The Illness Costs of Air Pollution**. 13 pgs.

Pembina Institute (2004) **Climate Change Solutions for Municipalities**.

<http://www.climatechangesolutions.com/municipal/default.shtml?o=intro>

Pollution Probe (2002) ***Towards an Adaptation Action Plan: Climate Change and Health in the Toronto-Niagara Region Summary for Policy Makers.*** 50 pgs.

Ridley, Justin (2005) ***City of Hamilton's Greenhouse Gas Emissions Inventory: A Review.*** 40 pgs.

Rowan Williams Davies & Irwin Inc. (2005) ***Development of Policy Papers for Phase Two of the Transportation Master Plan for the City of Hamilton AIR QUALITY POLICY PAPER.*** 31 pgs.

Rowan Williams Davies & Irwin Inc. (2005) ***Development of Policy Papers for Phase Two of the Transportation Master Plan for the City of Hamilton TRANSPORTATION ENERGY USE AND GREENHOUSE GAS EMISSIONS POLICY PAPER.*** 25 pgs.

Regional Municipality of Hamilton-Wentworth (1997) ***Climate Protection Action Plan, Impacts and Reduction Efforts for Municipal Operations.*** 27 pgs.

Union of Concerned Scientists and the Ecological Society of America (2003) ***Confronting Climate Change in the Great Lakes Region. Impacts on Our Communities and Ecosystems.*** 92 pgs.

United States Environmental Protection Agency (2006). ***Global Warming***

<http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html>

Victoria Transit Policy Institute (2006) ***Evaluating Public Transit Benefits and Costs. Best Practices Guidebook.*** 103pgs.

Wilson, Geoff (2006) "A Great Way to Respond to Climate Change." ***Urban Design Forum, 76***

## **Appendices**

**A – Vision 2020 Strategy Goals in the Corporate Air Quality and Climate Change Strategic Plan.**

**B- Government Action on Climate Change**

**C- Corporate Air Quality & Climate Change Actions**

## **Appendix A – Vision 2020 Strategy Goals in the Corporate Air Quality and Climate Change Strategic Plan.**

### **Air Quality & Climate Change**

- *To ensure the City has the best air quality of any major urban centre in Ontario;*
- *To have effective plans that identify, reduce and manage risks; and,*
- *To reduce greenhouse gas emissions.*

### **Water Quality & Supply**

- *To ensure the water quality in streams, Cootes Paradise, Hamilton Harbour, Lake Ontario and other surface bodies is generally good, that the water is clean and clear.*
- *To ensure the quality of groundwater throughout the City is suitable for drinking and is a source of pure recharge for surface waters.*
- *To reduce the municipal water use of households and businesses*
- *To ensure that water quality is not affected by run-off and sedimentation due to changes in the landscape.*

### **Tree-Planting & Preservation**

- *To develop and protect a system of interconnected natural areas which provides for the growth and development of native plants and wildlife and, where appropriate provides access for all citizens of the City of Hamilton.*

### **Land-Use Planning**

- *To curb urban sprawl and suburban encroachment onto rural and agricultural lands*
- *To encourage development which makes efficient and economical use of infrastructure and services.*
- *To minimize the environmental, social, and financial costs of new development to the residents of The City of Hamilton.*

### **Energy Conservation & Demand Management**

- *To reduce the consumption of non-renewable energy and eliminate the excessive and wasteful use of energy.*

## **Appendix A – Vision 2020 Strategy Goals in the Corporate Air Quality and Climate Change Strategic Plan.**

### **Transportation and Transportation Planning**

- *To develop an integrated sustainable transportation system for people, goods and services which is environmentally friendly, affordable, efficient, convenient, safe and accessible.*
- *To encourage a shift in personal lifestyle and behaviour towards transportation choices that enhance personal health and fitness, save money, and have the lowest environmental cost*
- *To use alternative modes of movement, such as, walking, bicycling, and public transit everyday .*

### **Waste Management & Reduction**

- *To reduce the amount of waste generated by residents, businesses and government in the City.*
- *To safely and responsibly manage waste.*

**Nine Directions to Guide Development.** The Nine Directions stem from the Vision2020 Strategy and the Building A Strong Foundation process and established nine directions to guide the development of GRIDS and Hamilton’s Official Plan. Below are two of the directions that are embraced by the Corporate Air Quality and Climate Change Strategic Plan.

*Direction #6 Expand transportation options that encourage travel by foot, bike and transit and enhance efficient inter-regional transportation connections*

*Direction # 8 Protect ecological systems and improve air, land and water quality.*

## Appendix B – Government Actions on Climate Change

### a) Provincial

The Provincial Government has introduced a number of initiatives for “**A Greener, Healthier Ontario**”. These include the introduction of 5% ethanol in gasoline, offering new agreements for wind and solar power energy generation, rebates for hybrid vehicles, improvements in the Building Code, the banning of incandescent light bulbs by 2012, a proposed rapid transit action plan for the Greater Toronto Area and Hamilton, and a proposed Municipal Eco Challenge Fund to help municipalities reduce greenhouse gas emissions.

Ontario has set out a plan of action to address climate change in a number of areas and has established the following targets:

- A reduction of greenhouse gases to 6 per cent below 1990 levels by 2014, or 61 Megatonnes.
- A reduction of greenhouse gases to 15 per cent below 1990 levels by 2020, or 99 Megatonnes.
- A reduction of greenhouse gases to 80 per cent below 1990 levels by 2050.

The province has decided to create an Ontario Climate Change Secretariat in the provincial Cabinet Office to make sure the government's numerous environmental plans – from banning conventional light bulbs to phasing out coal-fired power plants – are carried out and to lead Ontario's fight against climate change.

### b) Federal

In 2007, the Federal Government unveiled ***Turning the Corner: An Action Plan to Reduce Greenhouse Gases and Air Pollution***. The main focus of the plan is targeting industrial sectors to comply with mandated air and greenhouse gas emissions targets.

Under the federal plan, existing industry facilities will undertake a 6% reduction each year from 2007 to 2010, giving an enforceable 18% reduction from 2006 emission intensity, starting in 2010.

New facilities will have a three year grace period, before a 2% reduction annually is undertaken. National and sector specific caps on NO<sub>x</sub>, SO<sub>x</sub>, PM and VOCs will be underway from 2010 to 2015. The overall target of the federal government is a 20% reduction in emissions by 2020.

In addition, the Federal Government proposes to take action to reduce emissions from the transportation sector through fuel standards and the ecoENERGY for Personal Vehicles and ecoAUTO Rebate Programs, reduce energy usage in consumer and commercial products such as dishwashers, refrigerators, air conditioners, and commercial boilers and take action to improve indoor air quality.

### **c) International**

At the international level, the United Nations 1994 Convention on Climate Change sets the overall framework for intergovernmental efforts to tackle climate change. The Convention recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. 191 countries have signed and ratified the Convention.

Under the Convention, governments:

- Gather and share information on greenhouse gas emissions, national policies and best practices;
- Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and,
- Cooperate in preparing for adaptation to the impacts of climate change.

The adoption of the Convention and its commitments are not sufficient to tackle climate change. At the 1995 Conference of Parties (COP1) in Berlin, governments launched a round of talks to decide on stronger and more detailed commitments for industrialized countries. After two and a half years, the Kyoto Protocol was adopted at COP 3 in Kyoto, Japan.

The Kyoto Protocol shares the Convention's objective, principles and institutions, but strengthens the Convention by committing industrialized countries (such as Canada) to individual, legally-binding targets to limit or reduce their greenhouse gas emissions. In 1998, Canada adopted the Kyoto Protocol and pledged to reduce Canada's greenhouse gas emissions to six percent below 1990 levels during the commitment period of 2008 to 2012. Canada did not ratify Kyoto until 2002 and the Kyoto Protocol entered into force internationally in 2005.

Between December 3 to 15, 2007, the United Nations held a Climate Change Conference in Bali, Indonesia to set out the framework for negotiations of the "second phase" of the Kyoto Protocol, commencing in 2012, and attempted to lay the groundwork for strengthening global efforts to tackle climate change. Representatives from over 180 countries attended, together with observers from intergovernmental and nongovernmental organizations.

A meeting of environment ministers and experts held in June of 2007 called on the conference to agree on a road-map, timetable and 'concrete steps for the negotiations' with a view to reaching an agreement by 2009.

The agreement reached at Bali launches a two-year negotiation process for the post-2012 "Kyoto Phase 2". In addition to setting a range of emission reduction targets for industrialized countries, "the Bali roadmap" contains commitments to negotiate actions to control emissions in developing countries; financial agreements for adaptation and the transfer of climate-friendly technology; and an agreement to tackle the problem of deforestation in developing countries.

### Appendix C: Corporate Air Quality & Climate Change Actions - Policy Actions

Department/Division	AQ & CC Category	Item	Description	Short	Medium	Long	On-going
				3months - 1 year	1 year - 2 years	3 years +	
PED - Strategic Services/Special Projects	Land Use & Transportation Planning	Official Plan	Inclusion of air quality and climate change considerations in Hamilton's Official Plan				
PED - Strategic Services/Special Projects	Land Use & Transportation Planning	Official Plan & Secondary Plans	Promotion of Compact Form, efficient use of infrastructure & transit, improved "walkability"				
PED - Strategic Services/Special Projects	Air Quality Research	<i>Clean Air Hamilton</i>	Support and administration of <i>Clean Air Hamilton</i> to support research and policy analysis of air quality needs in Hamilton				
PED - Strategic Services/Special Projects	Smog Response	Corporate Smog Plan	Review and update the 2000 Corporate Smog Response Plan				
PED - Strategic Services/Special Projects	Air Quality Research	Air Quality Co-ordinator	Co-ordinate, educate and respond to efforts by the Corporation and the City to engage actions on air quality.				
PED - Strategic Services/Special Projects	Vision 2020	Vision 2020 Co-ordinator	Educate and manage Hamilton's Vision 2020 Strategy for the City				
PW - Waste Management	Waste Management & Reduction	Solid Waste Management Master Plan	Implementation of the City's Integrated Waste Management System, specifically 65% waste diversion by 2010				

PW - Water-Wastewater - Plant Capital & Planning	Water Quality & Supply	Water & Wastewater Master Plan	The master plans are consistent with and reflect the servicing needs for the preferred growth pattern which will form the basis of the City's new official plan, thereby ensuring efficient servicing and compact growth.				
PW - Water- Wastewater - Plant Capital & Planning	Waste Management & Reduction	Biosolids Master Plan	Long range plan addressing the management of wastewater treatment residuals (biosolids) with current production at 50,000 T/yr rising over the planning period (to 2035) to 90,000 T/yr.				
PED - Strategic Services/Special Projects	Land Use & Transportation Planning	GRIDS Implementation	30 year growth strategy for the City which will form the basis of the City's new official plan, ensuring compact growth.				
PED - Economic Development	Land Use & Transportation Planning	ERASE	Promotion of the rehabilitation and redevelopment of brownfield properties within 3,400 acres of old industrial area				
PED - Strategic Services/Special Projects	Land Use & Transportation Planning	Residential Intensification Program	Compact Form				
EMS- Emergency Planning	Climate Change Research	Climate Change Awareness - IPCC Reports	Production and distribution of summary reports based on the Intergovernmental Panel on Climate Change Working Group papers				

EMS- Emergency Planning	Climate Change Research	Climate Change 'Best Practices'	Possible creation of action panel on climate change best practices for emergency managers and business continuity practitioners (external to the city, with the Ontario Association of Emergency Managers & the Canadian Centre for Emergency Preparedness)				
EMS- Emergency Planning	Emergency Management	Hazard Identification & Risk Assessment	Evaluate Climate Change against 'greatest risks' facing the city				
EMS- Emergency Planning	Emergency Management	Hazard Identification & Risk Assessment	Evaluate Risk Management Guidelines recently produced for Canadian Municipalities				
PW - Capital Planning & Implementation	Land Use & Transportation Planning	Transportation Master Plan	Implementation of Transportation Master Plan recommendations				
PW - Capital Planning & Implementation	Land Use & Transportation Planning	Transportation Master Plan	Transportation Master Plan recommends one permanent FTE for TDM (currently temporary), starting in 2008				
PW - Capital Planning & Implementation	Land Use & Transportation Planning	Transportation Master Plan/Travel Demand Management	Transportation Master Plan recommends one permanent FTE for TDM (currently temporary), starting in 2008				
PW – Energy, Fleet & Facilities	Corporate Energy Plan	Energy Conservation and Demand Management	Implementation of energy conservation and demand management in Corporate buildings and operations to meet Corporate energy targets				
PW - Capital Planning & Implementation	Extreme Weather Events	Storm Event Response Group (SERG) - related studies	PM, Watershed Management undertakes studies to address findings of the Independent Community Panel and for areas which experienced flooding during the storms of 2005 and 2006				

PW - Capital Planning & Implementation	Water Quality & Supply	Stormwater Master Plan	Provide strategies for servicing and management guidance for the City's stormwater system (including storm trunk sewers) for the next 30 years, and a strategy to protect , enhance and restore the environmental resources within Hamilton's 15 watersheds				
PW - Energy, Fleet & Facilities	Fleet Greening	Green Fleets Implementation Plan	Plan to implement new vehicle and fuel technology in an affordable and sustainable way to reduce engine exhaust emissions from fleet vehicles				
PW - Energy, Fleet & Facilities	Fleet Greening	Idling Control Policy	Idling control policy for city vehicles				
HSR Transit	Fleet Greening	End of the Line idling Policy	Policy to reduce idling of vehicles at the end-of-the line of transit routes				

### Appendix C: Corporate Air Quality & Climate Change Actions – Operational Actions

Department/Division	AQ & CC Category	Item	Description	Short	Medium	Long	On-going
				3months - 1 year	1 year - 2 years	3 years +	
PW - Waste Management	Waste Management & Reduction	Green Cart Program	Organics diversion program for all single-family homes in the City				
PW - Waste Management	Waste Management & Reduction	Multi-Residential Green Cart Program	Organics diversion program for all multi-family dwellings in the City				
Public Works - Waste Management	Energy Management	Landfill Gas to Energy Collection System	On-site collection of landfill gas and production of energy				
PW - Water-Wastewater Customer Service & Community Outreach	Water Quality & Supply	Water Use Reduction	Initiatives to support and implement water conservation measures such as water metering and the Wise Water Use programs.				
PW - Water-Wastewater - Compliance & Regulations	Waste Management & Reduction	Sewer Use Bylaw	Regulation and Inspection to control and reduce metal and contaminant input to sewer and mitigating WWTP treatment load.				
PW - Water-Wastewater - Water Distribution & Wastewater Collection	Waste Management & Reduction	Combined Sewer Overflow (CSO) Management	Compliance with Procedure F-5-5 to reduce incidence of untreated release and mitigate WWTP treatment load.				
PW - Water-Wastewater - Plant Operations	Energy Management	Hamilton Renewable Power	WWTP sludge digester methane fuelling 1.6MW generator for production of 'green' energy.				

PW - Water-Wastewater - Compliance & Regulations	Waste Management & Reduction	Biosolids EMS	The Biosolids Environmental Management System (EMS) provides the City with a systematic approach and the necessary tools to ensure biosolids quality and application programs consistently comply with regulations and guidelines, maintains a pro-active community involvement program, and fosters continuous improvement in corporate mission / value statements.				
PW - Water - Wastewater - Plant Capital & Planning	Water Quality & Supply	Wastewater Investment Needs and Strategies (WINS)	WINS addresses Future Growth, water quality and wet weather treatment to protect and enrich environmental and public health; that Water and Wastewater Treatment Plants meet water quality objectives (e.g. RAP targets), and development (dry weather) capacity requirements, and to address wet weather flow issues in the collection system due to the high proportion of combined sewers				
PW- Traffic Engineering & Operations	Energy Management & Conservation	Traffic Lights Conversion	Conversion of traffic signal lights from incandescent to light emitting diodes (LEDs)				
PW- Traffic Engineering & Operations	City Operations	Traffic Signal Control	Timing of traffic signals to encourage transportation flow				
PW - Energy, Fleet & Facilities	Fleet Greening	Introduction of Hybrid Vehicles in Fleet	Introduction of hybrid vehicles into Corporate Fleet as available and affordable				

HSR Transit	Fleet Greening	Introduction of Hybrid buses in Fleet	Introduction of hybrid buses into the HSR fleet. 12 diesel/electric buses. - 5 40 foot & 7 articulated 60 foot buses.				
PW – Energy, Fleet & Facilities	Fleet Greening	Street Sweepers	Purchase of regenerative street sweepers that reduce fine particulate matter. 17 street sweepers purchased.				
HSR Transit	Transportation Demand Management	Employee Commuter Pass					
IT	Energy Management & Conservation	Corporate Computer Equipment Shutdown	Best practices for routine end of day shutdown of desktop computers result in a reduction of power consumption, reduce wear and time loss on systems, reduce security risks and will allow administrative updates, such as virus protection updates, to be loaded automatically at system start up.				
PW - Energy, Fleet & Facilities	Fleet Greening	Vehicle Idling Reduction					
PW - Operations & Maintenance	City Operations	Low emission equipment	Exploring the use of low emissions equipment in City operations				